

[NOTE.—Before the Committee organized its subcommittees for the 109th Congress, the following hearing was held under the Subcommittee on Veterans Affairs and Housing and Urban Development and Independent Agencies.]

**DEPARTMENTS OF VETERANS AFFAIRS AND
HOUSING AND URBAN DEVELOPMENT AND
INDEPENDENT AGENCIES APPROPRIATIONS
FOR FISCAL YEAR 2006**

THURSDAY, FEBRUARY 17, 2005

U.S. SENATE,
SUBCOMMITTEE OF THE COMMITTEE ON APPROPRIATIONS,
Washington, DC.

The subcommittee met at 9:01 a.m., in room SD-138, Dirksen Senate Office Building, Hon. Christopher S. Bond (chairman) presiding.

Present: Senators Bond, Stevens, and Mikulski.

EXECUTIVE OFFICE OF THE PRESIDENT

OFFICE OF SCIENCE AND TECHNOLOGY POLICY

**STATEMENT OF DR. JOHN H. MARBURGER, III, DIRECTOR, AND
SCIENCE ADVISOR TO THE PRESIDENT**

OPENING STATEMENT OF SENATOR CHRISTOPHER S. BOND

Senator BOND. Good morning. The Senate Appropriations Committee's Subcommittee on VA, HUD, and Independent Agencies' hearing on the 2006 budget request for NSF and OSTP will come to order.

My apologies for the confusion today. We are starting early because, as most of you know, this is a day when Secretary Rice will be testifying on the urgent supplemental at 10 o'clock. My colleague, Senator Mikulski, is in traffic and will be here about 9:15. She has asked that I proceed, and I apologize because we were held up for a half an hour by a traffic accident, so that is why the scramble.

This is a very important hearing that we wanted to begin. I welcome Dr. John Marburger from OSTP, Dr. Arden Bement from the National Science Foundation, and Dr. Warren Washington from the National Science Board.

Congratulations, Dr. Bement, for being confirmed last year as NSF's Director. I look forward to working with all three of you and hearing your testimony today.

Before I proceed with the business at hand, I recognize there are several questions surrounding the future structure of our committee. While this is an important issue and my staff and I have had to spend far too much time on it, I strongly believe that we cannot hold up work of the Senate and the taxpayers by waiting for this issue to be resolved. We intend to resolve it appropriately. We have to move forward. That is why we are here today.

While our colleagues across the Capitol say they want to avoid another omnibus, the hasty and ill-advised action they took last week will do just the opposite, forcing an omnibus, unless we can arrive at an accommodation. That is very unfortunate. As this particular panel knows, when we go into an omnibus, funds are cut out of the basic research that we need so badly. That is what happened last year.

I have been, as Senator Mikulski has been, and will continue to be a very strong supporter of NSF and a robust NSF budget. My support for the work at NSF has not and will not diminish.

I think this is a very important hearing today because it gives us an opportunity to talk about the critical role NSF plays in the economic, scientific, and intellectual growth of this Nation. Our country's future depends upon our ability to lead the world in science and technology, especially in the global marketplace. NSF is a primary tool in meeting the global challenges of the 21st century, pushing the boundaries of scientific research and technology. NSF's work should give us a better insight into the world around us. This work will build our economy, provide jobs, speed innovation, and improve the quality of life for all our people.

Unfortunately, the Federal Government has not adequately supported NSF in the physical sciences. I strongly believe that the funding disparity between life sciences and the physical sciences has grown too large. And I have had numerous physicians, medical researchers, scientists tell us that we are holding back work in developments in the life sciences because we are not funding the basic NSF sciences that support them. The funding imbalance directly jeopardizes our ability to lead the world in scientific innovation. As I said, the NIH work is jeopardized because by undermining the physical sciences, we are undermining the underpinning for medical technological advances.

Inadequate funding for NSF also hurts our economy and the creation of jobs. In recent years, there has been an outcry about outsourcing jobs to other countries. The best remedy for this issue is not protectionism but investing in education and skills of our future work force. This means better science and math education and technological skills, such as computer literacy. This is a major part of NSF's mission.

I met earlier this week with leaders of our Nation's major computer companies, and they were absolutely stunned by the lack of commitment and investment in this research. They point out that it takes 25 years for this basic research to translate into jobs and to practical applications, and by not funding it now, we are short-changing our Nation several years down the road.

Sadly, the budget request for NSF does not provide it with adequate resources to meet its mission. While Dr. Marburger and our friends at OMB will state that the NSF budget is one of the few

increases in the Federal budget, I am not happy. Dr. Marburger chided me for the slim funding for NSF last year, and Jack, do you remember what I said? I said I cannot do it if OMB undercuts us. And guess what? OMB has undercut us once again. It is especially disappointing because Senator Mikulski and I and my other colleagues have made great efforts to get on a path to double funding for NSF. We have fallen off that path drastically, but we are not going to give up.

This should be one of the highest priorities not just for this subcommittee but for the full committee, for the Congress and for the Nation. It means a greater effort by the research and high-tech sector in advocating and selling the virtues of NSF to the general public. Please, ladies and gentlemen, come out of your laboratories, come out of your think tanks, and let people know how important this funding is.

Now, I know there are significant shortfalls throughout the Federal budget, and our own committee, the VA-HUD subcommittee, such as it is or was or may be, has underfunding for VA medical care, community development block grants, and in EPA Clean Water. It is obviously going to be a major challenge to find the funds for NSF in 2006. But, Senator Mikulski and I are committed to NSF and we are going to work with the administration to increase the NSF budget as we move forward.

Given this constrained funding environment, it is even more critical that the National Science Board develop a long-term vision for NSF. In other words, Dr. Washington, we need a strategy that outlines what our priorities are, how we can get the biggest bang for our bucks through programs and activities supported by NSF. This does not mean looking into NSF to alter its grant size and duration. This means articulating a vision for the future of science and technology, including what are the new, bold, cutting-edge areas of research. We need a plan, a business plan, if you would, on how NSF will lead the research community in meeting these new, bold challenges. The Board has a tremendous talent pool available and we need you and the Board to tell us what are the activities that we must pursue for the future.

One of the specific areas that the Board should examine is the future of our Nation's math and science education. In its budget request, the administration has made some disturbing cuts to NSF's education portfolio, especially those programs serving K through 12 education. Every major assessment of math and science has shown how far our country's students have fallen behind the rest of the world in math and science proficiency. I understand that up to fourth grade, boys and girls are doing well, but by the time they get to the eighth grade, our students are out-performed by 8 countries in science and by 14 countries in math, including Latvia and Malaysia. Now, what are we thinking about? We have to address this problem before it is too late.

Our scientific education and research system must also ensure that no one is left behind. I am pleased that the budget request emphasizes the importance of broadening the participation of programs to under-represented groups such as minorities, women, and people with disabilities. Nevertheless, while OMB did not continue

its routine practice of the past in cutting these types of programs, flat funding is not an overwhelming response.

Moreover, flat funding programs that support under-represented groups is hurting our ability to address a growing national crisis where there is a shortage of new homegrown scientists and engineers. We are not attracting enough young students, especially minorities, into these disciplines.

In the past, we used to bring in students from foreign countries. We would educate them here and they would stay here and provide great resources for our country, and their intellectual capability was one of the assets that we could rely on. Now many of these students are going home because they can do the work in their home countries. We cannot continue to rely on foreign students coming and staying in the United States to fill the gap by retiring engineers and the scientists. We need to develop our students to fulfill those roles.

In addition, I have a strong interest in nanotechnology. The budget provides \$344 million for this important program. There is a tremendous amount of excitement about nanotechnology because of its far-reaching benefits from computers to manufacturing processes, to agriculture, to medicine.

And as everyone knows, I am also a very big supporter of plant biotechnology because it has generated exciting possibilities for improving human health and nutrition. Impressive research is being done with plant genomics that can eventually be a powerful tool for addressing hunger in developing countries like those in Africa and Southeast Asia. I am very pleased by the recent progress on sequencing the maize genome, led by researchers at the Danforth Plant Science Center and the collaboration between the University of Missouri-Columbia and Nepal on oilseeds from soybeans. I thank our good friend, Dr. Mary Clutter, for her work on these efforts and look forward to hearing more about it from her.

In addition to my concerns about funding, I have to address one particular area of concern. Specifically I remain concerned about the Foundation's continuing deficiencies in managing and overseeing its large research facility projects. I will not go into detail about the Inspector General's statement, which is made a matter for the record, but it indicates that NSF's progress in addressing large facility management problems has been slow. Dr. Bement, I understand you have taken these issues more seriously than your predecessor, but I need your firm commitment that you will immediately implement the IG and National Academy of Sciences' recommendations to correct these problems. I also believe the Board should oversee these more closely.

Lastly, the Board and Foundation must finalize the priority-setting process guidelines for large research facilities. I do not want to hear any more excuses. This is not rocket science. It is just good management.

I look forward to hearing the testimony of our witnesses today, and I will call on my colleague and partner, Senator Mikulski, when she arrives.

PREPARED STATEMENT

Now, because of the tightened time schedule, I would ask—Dr. Marburger gets 7½ minutes and Dr. Bement and Dr. Washington get 5. While you get ready, I will now turn it over to my colleague, Senator Mikulski. I have told them how the cow eats the cabbage, and you can continue from here.

[The statement follows:]

PREPARED STATEMENT OF SENATOR CHRISTOPHER S. BOND

The subcommittee will come to order. This morning, the VA–HUD and Independent Agencies Subcommittee will conduct its first hearing of the year and we begin with the fiscal year 2006 budgets for the National Science Foundation, the National Science Board, and the Office of Science and Technology Policy. I welcome back Dr. John Marburger from OSTP, Dr. Arden Bement from NSF, and Dr. Warren Washington from the National Science Board to our subcommittee. I congratulate Dr. Bement for being confirmed last year as NSF's new Director. I look forward to working with all three of you and hearing your testimony today.

Before I proceed with the business at hand, I recognize that there are a lot of questions surrounding the future structure of our committee. While this is an important issue, I strongly believe that we cannot hold up the work of the Senate and the taxpayers by waiting for this issue to be resolved. We must move forward. That is why we are here today. While our colleagues across the Capitol say they want to avoid another Omnibus, the hasty and ill-advised action they took this week will do just the opposite, forcing an Omnibus. That is unfortunate.

As many of you know, I have been, and will continue to be a strong supporter of NSF and a robust budget for NSF as well. My support for the work done at NSF has not, and will not diminish.

This is a very important hearing because it gives me the opportunity to talk about the critical role NSF plays in the economic, scientific and intellectual growth of this Nation. Our country's future resides in our ability to lead the world in science and technology, especially in the global marketplace. NSF is one of our primary tools in meeting the global challenges of the 21st Century by pushing the boundaries of scientific research and technology. NSF's work will give us a better insight into the world around us. This work will grow our economy and speed innovation, improving the quality of life for all people.

Unfortunately, the Federal Government has not adequately supported NSF and the physical sciences. I strongly believe that the funding disparity between the life sciences and the physical sciences has grown too large. This funding imbalance is alarming because it directly jeopardizes our Nation's ability to lead the world in scientific innovation. Further, we are jeopardizing the work of the National Institutes of Health because we are undermining the physical sciences, which provide the underpinning for medical technological advances.

Inadequate funding for NSF also hurts our economy and the creation of good jobs. In recent years, there has been an outcry of outsourcing jobs to other countries. The best remedy to this issue is not protectionism but investing in the education and skills of our future workforce. This means better math and science education and technological skills, such as computer literacy. This is also a major part of NSF's mission.

Sadly, the budget request for NSF does not provide it with the adequate resources to meet its mission. While Dr. Marburger and our friends at OMB will state that NSF's budget is one of the few increases in the Federal budget, it does not give me any solace. This is especially disappointing given the efforts of myself, Senator Mikulski, and many of my other colleagues to double the funding of NSF. We have fallen off the path for doubling NSF's budget, but we must not give up. This must remain one of our highest priorities, not of the subcommittee, but also the Nation. This must mean a greater effort by the research and high-tech sector in advocating and "selling" the virtues of NSF to the general public.

I recognize that there are significant funding shortfalls throughout the Federal budget, including some notable accounts within the VA–HUD jurisdiction such as VA medical care, HUD CDBG, and EPA Clean Water SRF. It is obviously going to be a major challenge to find additional funds for NSF for fiscal year 2006. Nevertheless, I am committed to NSF and I want to work with the administration to increase NSF's budget as we move forward.

Given the constrained funding environment, it is even more critical that the National Science Board develop a long-term vision for NSF. In other words, we need

a strategy that outlines how we can get the biggest bang for our buck through programs and activities supported by NSF. This does not mean how NSF will alter its grant size and duration. This means articulating a vision for the future of science and technology, including the next bold cutting-edge areas of research. We also need a plan on how NSF will lead the research community in meeting these new bold challenges. The Board is ideally suited for this responsibility and I believe strongly that it is a core activity of the Board's mission.

One of the specific areas that the Board should examine is the future of our Nation's math and science education. In this budget request, the administration has frankly made some disturbing cuts to NSF's education portfolio, especially to those programs serving K-12 education. Every major assessment of math and science has shown how far our country's students have fallen behind the rest of the world in math and science proficiency. In one recent study, our 8th grade students were outperformed by eight countries in science and by 14 countries in math including Latvia and Malaysia. That is simply unacceptable. We must obviously address this problem before it is too late.

Our scientific education and research system must also ensure that no one is left behind. I am pleased that NSF's budget recognizes the importance of broadening the participation of its programs to under-represented groups such as minorities, women, and people with disabilities. Nevertheless, while OMB did not continue its routine practice of the past in cutting these types of programs, flat-funding them in this budget request is still disappointing.

Moreover, flat-funding programs that support under-represented groups is hurting our ability to address a growing national crisis where there is a shortage of new homegrown scientists and engineers. We are not attracting enough young students, especially minorities, into these disciplines. We cannot continue to rely on using foreign students to stay in the United States and fill the gap created by retiring engineers and scientists.

In addition to the education programs, I have a strong interest in nanotechnology. The budget request provides NSF with \$344 million for this important program. There is a tremendous amount of excitement about nanotechnology because of its far-reaching benefits from computers to manufacturing processes to agriculture to medicine.

As everyone knows, I am a big supporter of plant biotechnology because it has generated exciting possibilities for improving human health and nutrition. The impressive research being done with plant genomics can eventually be a very powerful tool of addressing hunger in many developing countries such as those in Africa and Southeast Asia. I am pleased by the recent progress on sequencing the maize genome led by researchers at the Donald Danforth Plant Science Center and the collaboration between the University of Missouri-Columbia and Nepal on oilseeds from soybeans. I thank Dr. Clutter for her work on these efforts and look forward to hearing more about it from her.

In addition to my concerns about funding, I address one particular area of concern. Specifically, I remain troubled by the Foundation's continuing deficiencies in managing and overseeing its large research facility projects. Without going into detail, the Inspector General's statement for the record indicates that NSF's progress in addressing its large facility management problems has been slow. I understand that you, Dr. Bement, have taken these issues more seriously than your predecessor but I need your firm commitment that you will immediately implement the IG and National Academy of Sciences' recommendations to correct these problems. I also believe that the Board should get more heavily involved in this matter. Lastly, the Board and the Foundation must finalize the priority-setting process guidelines for large research facilities. I do not want to hear any more excuses. This is not rocket science.

I look forward to hearing the testimony of all the witnesses today and I now turn to my colleague and ranking member, Senator Mikulski, for her statement.

Senator MIKULSKI. Good morning, everybody. Senator Bond, it is the vagaries of traffic coming in from Baltimore.

Why do we not go to our witnesses and then when I go to my questions, I will give my opening statement. It gives me a chance to kind of regroup.

STATEMENT OF DR. JOHN H. MARBURGER, III

Senator BOND. Dr. Marburger.

Dr. MARBURGER. Thank you, Chairman Bond and Ranking Member Mikulski, members of the subcommittee. I am happy to appear before you once again to discuss the President's R&D budget for the fiscal year 2006 and I would like to thank you, Mr. Chairman, for your strong words of support for basic research and for research at NSF. We agree completely about the importance of science done by this agency. It is central to the scientific enterprise and a major funder of research in universities.

As you know, despite the exceptional pressures on this budget, it does propose an increase in Federal R&D funds. The budget does maintain a strong focus on winning the war against terrorism while moderating the growth in overall spending, and this focus is reflected in the proposed R&D investments. The administration has made difficult choices and maintains strength in priority areas such as nanotechnology, information technology, and so forth. Furthermore, while overall non-security discretionary spending is reduced by 1 percent, non-security R&D is not correspondingly diminished. The fiscal year 2006 proposal preserves the substantial increases made with your support during the first term of this administration, and my written testimony summarizes the extraordinary growth of R&D funding during the past 4 years.

BUDGET REQUEST

This budget requests \$132.3 billion for Federal R&D, an increase of \$733 million over the current year's 2005 R&D budget, which is a record. The budget allocates 13.6 percent of the total discretionary outlays to R&D which is the highest level in 37 years. Non-defense R&D accounts for 5.6 percent of the total discretionary outlays, an amount significantly greater than the 5 percent average over the last three decades.

So in my oral testimony, I am going to focus first on the OSTP budget, which is appropriated by this subcommittee, and then mention just very brief highlights on agency budgets within the jurisdiction of this subcommittee. And then Dr. Bement and Dr. Washington have much more detail about the budget of the National Science Foundation.

So first, OSTP. As you know, OSTP has primary responsibility in the White House for prioritizing and recommending Federal R&D, as well as for coordinating interagency research initiatives. The fiscal year 2006 request for my office is \$5,564,000, which represents a net decrease of about 12 percent below the 2005 enacted level. The major contributing factor for this reduction is that more than \$650,000 previously required to cover our costs of after-hour utilities and space rental is now requested by the Office of Administration within the Executive Office of the President's budget as part of its effort to administer centrally common enterprise services. So this explains a major shift in how the budget is put together.

The 2006 estimate reflects our continuing commitment to operate more efficiently and cost effectively without compromising the essential elements of a high-caliber science and technology agency, which is to say high-quality personnel. We continue to reduce funding in many object classes, non-personnel classes, such as equipment and transportation of things rather than people, to meet our

operating priorities. And we will continue to provide high quality support to the President and information to Congress, as well as to fulfill significant national homeland security and emergency preparedness responsibilities.

I will be glad to answer more questions about the OSTP budget, if there are any, but let me briefly summarize just in one bullet each, the budgets for the three agencies of this committee.

First, as you noted, NSF's budget would increase by 2.4 percent to \$5.6 billion in fiscal year 2006. This is, as you noted, an extremely important centerpiece for the Nation's science budget.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

The request for NASA is \$16.46 billion which is also a 2.4 percent increase from 2005, which does reflect a strong commitment by the administration to the missions of this agency. This budget request also makes some hard decisions, Mr. Chairman, trading off some projects with high technical risks to maintain others with high scientific value.

ENVIRONMENTAL PROTECTION AGENCY

In EPA, the science and technology request is \$792 million, which is a 2 percent increase over the previous year enacted, even before removing \$70 million in earmarks.

We have a number of interagency initiatives which my office has responsibility for coordinating. With President Bush's 2006 budget request of \$2.2 billion for the Network and Information Technology R&D initiative, the investment in this area over 5 years will total more than \$10.4 billion.

The National Nanotechnology initiative, which you expressed interest in and have supported strongly, President Bush's 2006 budget provides over \$1 billion for this multi-agency program, bringing the total investment under this program to \$4.7 billion.

We continue to support climate change, approximately \$1.9 billion, and with this request the administration will have invested more than \$9 billion over 5 five years to improve our understanding of the global climate system.

The hydrogen fuel initiative has a budget request of \$260 million, which is an increase of 16 percent from 2005 enacted. This initiative remains on track to meet President Bush's 5-year \$1.2 billion commitment to hydrogen research and development announced in his State of the Union address in 2003.

And in homeland security, the Science and Technology Directorate funding is to increase from \$1.1 billion to \$1.4 billion. The R&D there is focused on countering chemical, biological, radiological, nuclear, and other catastrophic threats.

PREPARED STATEMENT

So, Mr. Chairman and members of the subcommittee, America's science and technology capabilities are the envy of the world. I believe the President's fiscal year 2006 budget proposal maintains and selectively strengthens these capabilities in areas that are important to the Nation's national, homeland, and economic security.

And I would be pleased to answer questions about these or other aspects of the budget. Thank you.

[The statement follows:]

PREPARED STATEMENT OF DR. JOHN H. MARBURGER, III

Chairman Bond, Ranking Minority Member Mikulski, and members of the subcommittee, I am pleased to appear before you once again to discuss the President's research and development (R&D) budget. As I have said many times before, I greatly appreciate the effective working relationship between our office and your committee, which I believe has resulted in good outcomes for the Nation's science and technology enterprise.

The budget this year is subject to considerable pressure, as you know, and the President is committed to cutting the budget deficit in half by 2009. These factors make this year's budget proposal the tightest in nearly two decades.

Despite these pressures, Federal R&D funds will increase in the President's Fiscal Year 2006 Budget. The budget maintains a strong focus on winning the war against terrorism, while moderating the growth in overall spending, and this focus is reflected in the proposed R&D investments. The administration has also maintained high levels of support for priority areas such as nanotechnology, information technology, the hydrogen initiative, and space exploration. Furthermore, while overall "non-security" discretionary spending is reduced by 1 percent, "non-security" R&D is not correspondingly diminished. The fiscal year 2006 proposal preserves the substantial increases made—with your support—during the first term of this administration. This treatment of R&D is consistent with the President's commitment to science and technology and the vital role they play in meeting the Nation's goals for national and economic security and the quality of life.

Comparing R&D investments in this administration with investments in other top national priorities demonstrates this commitment: from fiscal year 2001 to this fiscal year 2006 proposal, Federal spending on Department of Homeland Security (DHS) activities will have increased 83 percent; Department of Education programs are up 40 percent; and Department of Defense spending is up 37 percent. At the same time total Federal investment in R&D will have increased 45 percent. The percentage increase in R&D has been second only to the increase in the Department of Homeland Security during President Bush's first 5 budget years.

This historic increase in R&D has not been confined to a single agency or field of science. It does include a significant investment in defense R&D, whose value to the Nation's technical enterprise extends well beyond the defense establishment. Defense R&D funds significant university and private sector research, supports a large number of scientists, engineers and technical experts, and is instrumental in training and recruiting the next generation of technical talent for the Nation. Non-defense R&D, however, has also benefited from similar large increases during the past 5 years.

I am emphasizing these historical data to provide a context for this year's request. Within a pattern of overall budget constraint, funds are provided that we believe are appropriate to maintain and refine the large program increases of previous years. Within the pattern of detailed agency budgets, priorities have been established and choices made that preserve the Nation's investment in the critically important assets of science and technology.

THE PRESIDENT'S FISCAL YEAR 2006 R&D BUDGET

The President's Fiscal Year 2006 Budget requests \$132.3 billion in Federal Research and Development funds, an increase of \$733 million over this year's (2005) record R&D budget. The Budget allocates 13.6 percent of total discretionary outlays to R&D—the highest level in 37 years. Non-defense R&D accounts for 5.6 percent of total discretionary outlays, an amount significantly greater than the 5.0 percent average over the past three decades.

While non-defense discretionary program budget authority is reduced by 0.26 percent in this proposal, non-defense R&D funds are increased by 0.74 percent. The category of Basic Research is maintained near its historically high level at \$26.6 billion in fiscal year 2006, slightly down from \$26.9 billion in fiscal year 2005.

The fiscal year 2006 request for the "Federal Science and Technology" (FS&T) budget, (a focus more on basic research, as recommended by the National Academy of Sciences to) is \$61 billion, or a 1 percent reduction from the fiscal year 2005 enacted level. However, this reduction is entirely attributable to the removal of earmarks, most notably in the Department of Defense (over \$1 billion) and the Department of Agriculture (approximately \$340 million). The President's Fiscal Year 2006

Budget request does not continue fiscal year 2005 earmarks beyond fiscal year 2005, instead increasing programs of priority to research agencies. Earmarks are not consistent with using funds most efficiently to target agency missions or to support the best research. The administration strongly supports awarding research funds based on merit review through a competitive process, and we are prepared to work with Congress to achieve consistency in Legislative and Executive priorities to fund the best scientific research possible.

Not all programs can or should receive equal priority, and this budget reflects priority choices consistent with recommendations from numerous expert sources. In particular, this budget is informed by recommendations from the President's Council of Advisors on Science and Technology (PCAST), and reflects an extensive process of consultation among the Federal agencies, the Office of Management and Budget (OMB), and the Office of Science and Technology Policy (OSTP).

As in previous years this R&D budget highlights collaborations among multiple Federal agencies working together on broad themes. I will describe some individual agency highlights, followed by the five multi-agency R&D priorities highlighted in the President's Fiscal Year 2006 Budget: Networking and Information Technology R&D; National Nanotechnology Initiative; Climate Change R&D; Hydrogen Fuel Initiative; and Homeland Security R&D.

AGENCY BUDGET HIGHLIGHTS

Office of Science and Technology Policy (OSTP)

The Office of Science and Technology Policy, which I lead, has primary responsibility in the White House for prioritizing and recommending Federal R&D, as well as for coordinating interagency research initiatives. The fiscal year 2006 request for OSTP is \$5,564,000, which represents a net decrease of \$764,000, or 12.1 percent, below the fiscal year 2005 enacted level. The major contributing factor for this reduction is that \$653,000, previously required to cover OSTP's cost of after-hour utilities and space rental, is now requested by the Office of Administration, within the Executive Office of the President, as part of its effort to centrally administer common enterprise services.

The estimate for fiscal year 2006 reflects OSTP's continuing commitment to operate more efficiently and cost-effectively without compromising the essential element of a top-caliber science and technology agency—high quality personnel. OSTP continues to reduce funding in many object classes, such as equipment and transportation of things, to meet operating priorities. OSTP will continue to provide high quality support to the President and information to Congress, as well as to fulfill significant national and homeland security and emergency preparedness responsibilities.

National Science Foundation (NSF)

Funds are requested to increase the budget for NSF by 2.4 percent to \$5.6 billion in fiscal year 2006, 26 percent above 2001's \$4.4 billion level. Similar investments in the past have yielded important scientific discoveries, which boost economic growth and enhance Americans' quality of life.

NSF leads two administration priority research areas that promise to strengthen the Nation's economy: the National Nanotechnology Initiative (NNI) and the Networking and Information Technology R&D program (NITRD). NSF-funded nanotechnology research, proposed at \$344 million in fiscal year 2006, a 1.6 percent increase over 2005 and 129 percent since 2001, has advanced our understanding of materials at the molecular level and has provided insights into how innovative mechanisms and tools can be built atom by atom. This emerging field holds promise for a broad range of developing technologies, including higher-performance materials, more efficient manufacturing processes, higher-capacity computer storage, and microscopic biomedical instruments and mechanisms. NSF's investments in NITRD, funded at \$803 million in 2006, a 1 percent increase over 2005 and 26 percent since 2001, support all major areas of basic information technology (IT) research. NSF also incorporates IT advances into its scientific and engineering applications, supports using computing and networking infrastructure for research, and contributes to IT-related education for scientists, engineers, and the IT workforce.

Growing concerns about the vulnerability of computers, networks and information systems have prompted increased NSF investments in cyber security research, education and training. The Fiscal Year 2006 Budget provides \$94 million for these activities.

Every research discipline in the agency is increased between 1 to 3.5 percent, allowing the grant funding rate to be restored to 21 percent (from 20 percent in 2005). Funding is provided for the five Major Research Equipment (MRE) projects already

approved (Atacama Large Millimeter Array, EarthScope, the IceCube Neutrino Observatory, the Rare Symmetry Violating Processes (RSVP) installation, the National Ecological Observatory Network (NEON), and the Scientific Ocean Drilling Vessel).

In order to most effectively and efficiently support the Nation's polar research activities in Antarctica, funding for three polar icebreakers is being transferred from the U.S. Coast Guard to NSF (\$48 million). In the future, this will permit NSF to define the options for refurbishment or replacement of two of the ships, as well as operational options for the third (Arctic) icebreaker.

The Fiscal Year 2006 Budget will continue NSF's efforts to prepare U.S. students for the science and engineering workforce, with funds for 4,600 graduate research fellowships and traineeships. NSF provides annual stipends in these programs of \$30,000, which is significantly higher than the average stipend of \$18,000 in 2001.

National Aeronautics and Space Administration (NASA)

During the year since the President outlined a bold vision for sustained and affordable human and robotic exploration of space, NASA has restructured its organization and reprioritized its programs. The current human spaceflight programs, Shuttle and International Space Station, are focusing research and technology development on enabling the vision, while requirements are being established for the next generation of space transportation. An exciting array of space science missions are being planned that will enhance our understanding of the solar system, including interactions between the Earth and the space environment, and building observatories that will peer further into the cosmos to understand the origin of the universe, its structure, evolution and destiny.

The President's Fiscal Year 2006 Budget request for NASA is \$16.456 billion, a 2.4 percent increase from 2005, reflecting a strong commitment by the administration to pursue the exploration vision. The Fiscal Year 2006 Budget request also makes some hard decisions, canceling some projects with high technical risk and others whose cost estimates would have led to the certain cancellation and delay of several other important programs. The budget request maintains NASA's focus on exploration and science while strengthening the long-term foundation for continued success.

The budget requests about \$3.2 billion in fiscal year 2006 for new vehicles and technologies to enable sustained human and advanced robotic exploration far from Earth. NASA has identified the major requirements for a Crew Exploration Vehicle that will carry astronauts to the Moon. NASA plans to perform risk reduction tests in 2008 and stage its first crewed flight by 2014. NASA will also continue pursuing nuclear technologies for space applications, optical communications for high data rate connectivity to space probes, radiation shielding, and other advanced technologies to support the exploration vision. In addition, NASA is pursuing innovative means to engage private industry including offering space prizes to spur innovation.

The budget requests approximately \$5.5 billion in fiscal year 2006 to continue advancing our scientific understanding of the Sun, Earth, and planets and to inform decisions regarding appropriate human exploration missions. NASA will also build on its legacy of revolutionizing astronomy by continuing current operations of space telescopes such as Hubble, Chandra, and Spitzer while planning for the next generation of spacecraft that will enhance our ability to find planets around other stars, peer deep into the history of the universe, and improve our understanding of its structure.

The Fiscal Year 2006 Budget continues to fund critical investments in Earth science satellites, technologies, and research. NASA will continue to play a major part in the interagency Climate Change Science Research Program, and contribute to the international initiative on the Global Earth Observing System of Systems.

The budget requests approximately \$6.4 billion in fiscal year 2006 for operating the Space Shuttle and continuing assembly and operations of the International Space Station. NASA is examining configurations that meet the needs of both the new space exploration vision and our international partners using as few Shuttle flights as possible to enable Shuttle retirement by 2010, following completion of its role in ISS assembly. In concert with the new vision, NASA will refocus U.S. Space Station research on activities that prepare human explorers to travel beyond low Earth orbit, such as developing countermeasures against space radiation and understanding long-term physiological effects of reduced gravity.

As the United States implements the Vision for U.S. Space Exploration, the administration recognizes the value of effective cooperation with Russia to further our space exploration goals. At the same time, we have to appropriately reflect U.S. non-proliferation policy and objectives in our relationship with Russia. The administration is thus interested in seeking a balanced approach that continues to protect our nonproliferation goals while advancing potential U.S. cooperation with Russia on

the Vision for U.S. Space Exploration. Such a balanced approach must include the Iran Nonproliferation Act of 2000 (INA), which currently complicates cooperation with Russia on the International Space Station (ISS), and will also have an adverse impact on cooperation with Russia on our future space exploration efforts related to human space flight. To that end, the administration looks forward to working with Congress to ensure that the Vision for U.S. Space Exploration is able to succeed while remaining fully consistent with broader U.S. national security and non-proliferation goals.

Environmental Protection Agency (EPA)

The fiscal year 2006 request for science and technology funding at EPA is \$792 million, a 2 percent increase over fiscal year 2005, even before removing \$70 million in earmarks. This investment supports core Agency programs and strengthens the application of science to EPA regulatory actions and other programs.

The administration is directing \$20 million of S&T funding to a new pilot program within EPA that the program offices (e.g., Water, Office of Solid Waste and Emergency Response, Air) would then use to fund applied research in the Office of Research and Development (ORD). This is intended to improve the use of ORD (to avoid duplicative program efforts), coordination between the program offices and ORD, and responsiveness and accountability. This program contributes to the overall increase in S&T funding.

Seventy-nine million dollars in new funding will support homeland security projects and research at EPA related to water security monitoring and surveillance, post-incident building and environmental decontamination, and Environmental Laboratory Preparedness and Response.

The Fiscal Year 2006 Budget requests approximately \$65 million for the Science to Achieve Results (STAR) program, which includes a decrease in exploratory research grants. Given the overall tightness of EPA's budget (–6 percent from 2005 enacted), and the need to fund core programmatic needs, STAR grants, which cannot focus on EPA program needs, were reduced.

Department of Veterans Affairs (VA)

The Fiscal Year 2006 Budget requests that over three quarters of a billion dollars (\$786 million) be directly appropriated to VA for medical and prosthetic R&D, an 11 percent increase since fiscal year 2001. Another \$866 million is anticipated to be provided from other government agencies and private entities to support VA-conducted research, bringing total VA R&D program resources to \$1.7 billion, 3 percent more than fiscal year 2005.

The proposed VA R&D budget provides for a comprehensive intramural research program to acquire veteran-specific medical knowledge and create targeted innovations that address the special health care needs of the Nation's veterans. This includes biomedical disease research, disability rehabilitation R&D, development of best practices for more effective and efficient health care delivery, clinical pharmacological and surgical studies in veterans, and indirect costs. The research is focused on trauma-related illness, sensory loss, military occupational effects, environmental exposures, mental illness, substance abuse, chronic disease and aging.

PRIORITY INITIATIVES

The 2006 budget highlights priority interagency initiatives described briefly below. These initiatives are coordinated through the National Science and Technology Council (NSTC) for which my office has responsibility for day-to-day operations. The Council prepares research and development strategies that cross agency boundaries to form a consolidated and coordinated investment package.

Networking and Information Technology R&D.—With President Bush's Fiscal Year 2006 Budget request of \$2.2 billion for the Networking and Information Technology R&D (NITRD) program, the investment in this area over 5 years will total more than \$10.4 billion. Research in networking and information technologies underpins advances in virtually every other area of science and technology and provides new capacity for economic productivity. Through active coordination, NITRD agencies mutually leverage resources to make broader advances in networking and information technology than any single agency could attain.

- NSF continues to provide the largest share of Federal NITRD funding, reflecting the Foundation's broad mission as well as its leadership role in coordinating NITRD activities. The fiscal year 2006 request for NSF is \$803 million, an \$8 million increase from the 2005 estimate.

- High-end computing continues to be a major focus within the NITRD program. In fiscal year 2004, the interagency High End Computing Revitalization Task Force (HECRTF) produced the Federal Plan for High-End Computing, which de-

scribes a roadmap for progress in core technologies for high-end computing, mechanisms for improving access to high-end computing resources, and strategies for improving Federal procurement and coordination of high-end systems. The Fiscal Year 2006 Budget reflects the continuation of NITRD activities that are consistent with recommendations described in the Federal Plan, such as investments in new high-end systems by NASA and DOE's Office of Science.

- NASA continues to emphasize high-end computing within its NITRD portfolio through the recently-completed acquisition of the Project Columbia supercomputer, a portion of which NASA plans to make available to other Federal users. Following completion of the acquisition of Columbia, NASA's expenditure in high-end computing is normalizing at a lower level.
- The Department of Energy's (DOE's) Office of Science has also committed to operate their new Leadership Class Computing facility at the Oak Ridge National Laboratory as a national user facility. DOE's fiscal year 2006 request of \$25 million for the Leadership facility brings that Federal investment to \$100 million.

National Nanotechnology Initiative.—President Bush's Fiscal Year 2006 Budget provides over \$1 billion for the multi-agency National Nanotechnology Initiative (NNI), bringing the total NNI investment under this administration to \$4.7 billion. This sustained investment will advance our understanding of the unique phenomena and processes that occur at the nanometer scale and expedite the responsible use of this knowledge to achieve advances in medicine, manufacturing, high-performance materials, information technology, and energy and environmental technologies.

- The largest investments continue to be made by NSF where the fiscal year 2006 NSF request is \$344 million, an increase of \$6 million over the 2005 estimate.
- DOE contribution to the initiative ramps up dramatically with commencement of operations in four of its five new major Nanoscale Science Research Centers located across the country. The Centers will provide research equipment and infrastructure that will be broadly available to researchers from across the scientific research community. Construction completion keeps total DOE NNI spending flat in fiscal year 2006, but a portion of construction roll-off funds are made available for operational support.
- The fiscal year 2006 request of \$147 million by the Department of Health and Human Services (HHS) includes programs at the National Institutes of Health (NIH) emphasizing nanotechnology-based biomedical advances occurring at the intersection of biology and the physical sciences, such as the National Cancer Institute's Alliance for Nanotechnology in Cancer, and at the National Institute of Occupational Safety and Health (NIOSH) that address implications and applications of nanotechnology for health and safety in the workplace.
- With the addition of NIOSH, 11 Federal agencies currently fund nanotechnology research and development under the NNI, and another 11 participate in coordination. Agencies that have joined the NNI as participants over the past year include the U.S. Patent and Trademark Office and the Consumer Product Safety Commission, indicating the increasing importance of commercialization activities.

Climate Change Research and Development.—The Fiscal Year 2006 Budget continues strong support for the Climate Change Science Program (CCSP) and the Climate Change Technology Program (CCTP).

- The CCSP budget continues to support the goals outlined in the CCSP Strategic Plan, which was released in July 2003. Beginning in fiscal year 2006, CCSP will formally track the expected actions, deliverables, and milestones for each of its programs in order to assess overall performance.
- The Fiscal Year 2006 Budget proposes approximately \$1.9 billion to fund CCSP, virtually the same as 2005 despite reductions in NASA (–\$102 million) due to re-prioritization of programs. With this request, the administration will have invested more than \$9 billion over 5 years to improve our understanding of the global climate system.
- The Fiscal Year 2006 Budget provides approximately \$2.9 billion for the U.S. Climate Change Technology Program (CCTP), which supports research, development, deployment, and voluntary programs to reduce greenhouse gas emissions via renewable energy, fossil energy and nuclear energy, efficiency improvements, and carbon sequestration.
- In 2005, the CCTP will publish a draft Strategic Plan and solicit comments from the scientific community and the public. The CCTP will also identify within its portfolio a subset of National Climate Change Technology Initiative (NCCTI) priority activities.

Hydrogen Fuel Initiative.—The Hydrogen Fuel Initiative (HFI) seeks to develop new science and technology to support a major shift toward the use of hydrogen as an energy medium, particularly for transportation. The Fiscal Year 2006 Budget for HFI is \$260 million, \$35 million (16 percent) greater than the fiscal year 2005 level. The Initiative remains on track to meet President Bush's 5-year, \$1.2 billion commitment to hydrogen research and development announced in his 2003 State of the Union address. Some highlights include:

- \$20 million, an \$11 million (122 percent) increase over fiscal year 2005, will fund the Nuclear Hydrogen Initiative. This initiative will conduct the R&D on enabling technologies, demonstrate nuclear-based hydrogen production technologies, and study potential hydrogen production schemes to support the President's vision for a future Hydrogen economy.
- \$33 million for fundamental research within DOE's Office of Science. This research seeks to overcome key technical hurdles in hydrogen production, storage, and conversion, by seeking revolutionary breakthroughs in areas such as non-precious-metal catalysts, high-temperature membrane materials, multifunctional nanoscale structures, biological and photoelectrochemical hydrogen production, and precision manufacturing processes.
- Congressional earmarking is slowing progress on HFI, however, and may jeopardize the ability of the administration to achieve its goal of a 2015 decision by industry to commercialize fuel cell vehicles and infrastructure. In 2005, DOE's Hydrogen Technology Program, a key component of HFI, received 17 earmarks totaling \$37 million, about 40 percent of the program's funding.

Homeland Security.—Technology continues to help secure our Nation against terrorism. Research and development over the past 3 years in detectors against weapons of mass destruction (WMD) threat agents, medical countermeasures to improve public health preparedness and to protect our Nation's food and livestock, and advances in protecting the First Responders are moving from laboratory to operational use. The President's Fiscal Year 2006 Budget continues an aggressive investment in research, development, and the research infrastructure so as to further enhance our Nation's security. Priority research areas include:

- \$227 million to fund the creation of a Domestic Nuclear Defense Office (DNDO) in DHS, whose responsibility will be to develop a comprehensive system to detect and mitigate any attempt to import or transport a nuclear explosive device, fissile material or radiological material intended for illicit use within the United States.
- \$1.8 billion to the HHS to fund research and development of countermeasures against biological, chemical and radiological threat agents.
- \$596 million is allocated for the U.S. Department of Agriculture, HHS and DHS to improve food and agriculture defense. This includes funding for research on exotic and emerging diseases of plants and animals and to prevent and detect food contamination, expanding and improving laboratory facilities, and enhancing disease monitoring, surveillance and vaccine storage.
- \$94 million will fund new and ongoing research at EPA related to their role in water security and post-incident decontamination. Systems for monitoring and surveillance of terrorist threat agents in drinking water will be piloted in several U.S. cities. Decontamination capabilities will be strengthened by testing new cleaning methods, systems and antimicrobial products for buildings and outdoor areas and by conducting risk assessment work to support decontamination/revision of cleanup guidance goals.

MANAGING THE FEDERAL RESEARCH BUDGET

Consistent with the President's Management Agenda, the administration is improving the effectiveness of the Federal Government's investments in R&D by applying transparent investment criteria in analyses that inform recommendations for program funding and management. R&D performance assessment must be done carefully to avoid negatively impacting scientific productivity. Research often leads scientists and engineers down unpredictable pathways with unpredictable results. This characteristic of research requires special consideration when measuring an R&D program's performance against its initial goals.

Elements of good R&D program management include establishing priorities with expected results, specifying criteria that programs or projects must meet to be started or continued, setting clear milestones for gauging progress, and identifying metrics for assessing results.

The R&D Investment Criteria accommodate the very wide range of R&D activities, from basic research to development and demonstration programs, by addressing three fundamental aspects of R&D:

- Relevance*.—Programs must be able to articulate why they are important, relevant, and appropriate for Federal investment;
- Quality*.—Programs must justify how funds will be allocated to ensure quality; and
- Performance*.—Programs must be able to monitor and document how well the investments are performing.

R&D projects and programs relevant to industry are expected to meet criteria to determine the appropriateness of the public investment, enable comparisons of proposed and demonstrated benefits, and provide meaningful decision points for completing or transitioning the activity to the private sector.

OSTP and OMB are continuing to assess the strengths and weaknesses of R&D programs across the Federal Government in order to identify and apply good R&D management practices throughout the government.

CONCLUSION

Making choices is difficult even when budgets are generous. But tight budgets have the virtue of focusing on priorities and strengthening program management. This year's R&D budget proposal maintains levels of funding that allow America to maintain its leadership position in science and move ahead in selected priority areas. It is responsible in its treatment of security-related science and technology, and it rewards good planning and management.

America currently spends one and a half times as much on Federally funded research and development as Europe does, and three times as much as Japan, the next highest investor in R&D. Our scientists collectively have the best laboratories in the world, the most extensive infrastructure supporting research, the greatest opportunities to pursue novel lines of investigation, and the most freedom to turn their discoveries into profitable ventures if they are inclined to do so.

We lead not only in science, but also in translating science to economically significant products that enhance the quality of life for all people.

This budget will sustain this leadership and maintain science and technology capabilities that are the envy of the world. I would be pleased to respond to questions.

Senator BOND. Thank you very much, Dr. Marburger. Let me point out, in the interest of full disclosure, the 2.4 percent increase actually—part of it, \$48 million, is attributed to transferring from the National Science Foundation funds to fund the icebreaking costs for operations in Antarctica. This has been in the budget, so the true increase for NSF is \$84 million, or only a 1.5 percent increase, and it is still significantly below the high-water mark for this budget in 2004. It is \$47 million short of where we were 2 years ago. Thank you very much, Dr. Marburger.

Dr. Bement.

NATIONAL SCIENCE FOUNDATION

STATEMENT OF DR. ARDEN L. BEMENT, JR., DIRECTOR

Dr. BEMENT. Thank you, Chairman Bond, Ranking Member Mikulski. It is a pleasure to appear before you today to discuss NSF's fiscal year 2006 budget request and to express my personal appreciation for the strong support you and your colleagues have shown for NSF over the years.

BUDGET REQUEST

NSF's fiscal year 2006 budget request reflects the administration's support for our mission. In light of the tight fiscal climate, we have fared relatively well. For the coming fiscal year, NSF requests \$5.6 billion, an increase of \$132 million, or 2.4 percent over last year's appropriation levels.

The total funding for NSF research and related activities account in this request increases by \$113 million, nearly 3 percent, to \$4.33 billion. As you pointed out, of this amount, \$48 million is trans-

ferred to NSF from the Coast Guard for operation and maintenance expenses related to icebreaking in the Antarctic. We are working with the Coast Guard to explore options for funding icebreaker services in support of science within available NSF resources.

Maintaining strong and robust research programs in support of individual investigators and small groups of researchers is at the core of NSF's mission. In many scientific disciplines, NSF is a major source for Federal funding to academic institutions. One goal in this year's request is to strengthen our research support across all areas in our portfolio.

Research, however, is only part of the NSF equation. Our mission includes education as well. In our request, we will maintain a total investment of almost \$400 million for programs with a proven track record in broadening the participation of under-represented groups in the science and engineering arena. The Louis Stokes Alliances for Minority Participation, the Centers for Research Excellence in Science and Technology, and the Robert Noyce Scholarship Program, the STEM Talent Extension Program, and EPSCoR, just to name a few, are protected from reductions in this request.

Overall, the Education and Human Resources Directorate at NSF will be funded at \$737 million, down 12.4 percent from last year. Although we have found it necessary to make cuts in these programs, we are also finding ways to leverage other resources in support of education. We will, for example, continue to encourage the types of partnerships between researchers and students in our R&RA portfolio that provides hands-on learning experiences.

We are committed to ensuring that future generations gain the skills, knowledge, and insight that comes from working at the frontier of discovery. We will also maintain our strong working relationship with the Department of Education to implement best practices in their initiatives supporting math and science education.

RESEARCH EQUIPMENT AND FACILITIES CONSTRUCTION ACCOUNT

While there are no new starts in our major research equipment and facilities construction account, NSF is increasing funding in this account by \$76 million, for a total of \$250 million, to continue to fund ongoing projects.

NSF directly supports roughly 200,000 scientists, educators, and students and processes over 40,000 proposals a year. Balancing the needs of a growing, increasingly complex portfolio with new requirements for security, e-business practices, accountability, and award oversight presents an ongoing challenge. In order to meet these management goals, NSF will increase funding for activities that advance organizational excellence by \$46 million to a total of \$336 million. This increase will allow for the recruitment of 23 additional full-time employees, enhancement of and security of our e-government systems and continuing the implementation of the business analysis recommendations that we have been working on during the past 3 years.

PREPARED STATEMENTS

Mr. Chairman, I have only touched upon the variety and richness of the NSF portfolio. NSF research and education efforts con-

tribute greatly to the Nation's innovation-driven economy and help keep America at the forefront of science and engineering. NSF-supported researchers produce leading-edge discoveries that serve society and spark the public's curiosity and interest. Extraordinary discoveries coming from dozens of NSF programs are enriching the entire science and engineering enterprise and making education fun, exciting, and achievement-oriented.

Thank you and I will be glad to answer any of your questions. Senator BOND. Thank you, Dr. Bement.
[The statements follow:]

PREPARED STATEMENT OF ARDEN L. BEMENT, JR.

Chairman Bond, Ranking Member Mikulski, and members of the committee, thank you for this opportunity to discuss NSF's Fiscal Year 2006 Budget Request. It is a pleasure to appear before you today. For over 50 years, NSF has been charged with being a strong steward of the scientific discovery and innovation that has been crucial to increasing America's economic strength, global competitiveness, national security, and overall quality of life.

For many years, the United States economy has depended heavily on investments in research and development—and with good reason. America's sustained economic prosperity is based on technological innovation made possible, in large part, by fundamental science and engineering research. Innovation and technology are the engines of the American economy, and advances in science and engineering provide the fuel.

Investments in science and technology—both public and private—have driven economic growth and improved the quality of life in America for the last 200 years. They have generated new knowledge and new industries, created new jobs, ensured economic and national security, reduced pollution and increased energy efficiency, provided better and safer transportation, improved medical care, and increased living standards for the American people. Innovation and technology have become the engines of the American economy, and advances in science and engineering provide the fuel.

Investments in research and development are among the highest-payback investments a Nation can make. Over the past 50 years technological innovation has been responsible for as much as half of the Nation's growth in productivity.

Sustaining this innovation requires an understanding of the factors that contribute to it. The Council on Competitiveness, a consortium of industry, university, and labor leaders, has developed quantitative measures of national competitiveness: the number of R&D personnel in the available workforce; total R&D investment; the percentage of R&D funded by private industry; the percentage of R&D performed by the university sector; spending on higher education; the strength of intellectual property protection, openness to international competition; and per capita gross domestic product. A similar set of indicators has been developed by the World Bank Group, and voluminous data have been compiled by NSF. The important point underscored by these indicators is that, for America to remain a prosperous and secure country, it must maintain its technological leadership in the world.

Perhaps the Council on Competitiveness' 2004 National Innovation Initiative report captured it best by simply stating, "Innovation has always been the way people solved the great challenges facing society."

Often times, the connection between an area of research, or even a particular scientific discovery, and an innovation may be far from obvious. Fundamental research in physics, mathematics and high-flux magnets supported by NSF led to the development of today's Magnetic Resonance Imaging (MRI) technology. Today, MRIs are used widely to detect cancer and internal tissue damage. Fundamental research on extremophiles, or microorganisms living in extreme environments, led to the polymerase chain reaction, a procedure paramount to modern biotechnology, as well as one that allows us to use DNA for forensic evidence. Continuing progress in basic science and engineering research promises more discoveries as well as further improvements in living standards and economic performance.

And still, science and engineering is becoming an ever-larger portion of our Nation's productivity. In the early 1950's, Jacob Bronowski wrote, "The world today is powered by science." I would take this premise one step farther, "No science; no economic growth." Our current level of scientific and technological productivity is what keeps us ahead of our global competitors as the playing field continues to become more level.

NSF has helped advance America's basic science and engineering enterprise for over 50 years. Despite its small size, NSF has an extraordinary impact on scientific and engineering knowledge and capacity. While NSF represents only 4 percent of the total Federal budget for research and development, it accounts for 50 percent of non-life science basic research at academic institutions. In fact, NSF is the only Federal agency that supports all fields of science and engineering research and the educational programs that sustain them across generations. NSF's programs reach over 2,000 institutions across the Nation, and they involve roughly 200,000 researchers, teachers, and students.

NSF specifically targets its investments in fundamental research at the frontiers of science and engineering. Here, advances push the boundaries of innovation, progress and productivity.

Compared to other commodities, knowledge generated from basic science investments is unique, long lasting and leverages on itself. Knowledge can be shared, stored and distributed easily, and it does not diminish by use. Incremental advances in knowledge are synergistic over time. NSF is proud to have built the foundation for this knowledge base through decades of peer-reviewed, merit-based research.

FISCAL YEAR 2006 BUDGET REQUEST

The Foundation's Fiscal Year 2006 Budget Request reflects the administration's confidence in our continuing with this mission. In light of the tight fiscal climate, NSF fared relatively well. For the coming fiscal year, NSF requests \$5.6 billion, an increase of \$132 million, or 2.4 percent, over last year's appropriated levels.

At a time when many agencies are looking at budget cuts, an increase in our budget underscores the administration's support of NSF's science and engineering programs, and reflects the agency's excellent management and program results.

With the wealth of benefits that investments in science and engineering bring to the Nation, perhaps none is more powerful than the capability to respond quickly and effectively to challenges of all kinds. NSF's programs reach over 2,000 institutions across the Nation, and they involve researchers, teachers, and students in all fields of science and engineering and at all levels of education. They also keep us abreast of scientific advances throughout the world. This breadth of activity in and of itself creates a vital national resource, as it provides the Nation with a constantly invigorated base of knowledge, talent, and technology. For example, in areas ranging from terrorism threats to natural disasters, NSF's ongoing support of research in areas such as advanced information technologies, sensors, and earthquake engineering ensures a broad base of expertise and equipment that allows the science and engineering community to respond quickly in times of need and in partnership with scientists and engineers from other countries.

Four funding priorities centering this year's request are designed to address current national challenges and strengthen NSF's core research investments. They include: (1) Strengthening core disciplinary research; (2) Providing broadly accessible cyberinfrastructure and world-class research facilities; (3) Broadening participation in the science and engineering workforce; and (4) Sustaining organizational excellence in NSF management practices.

This year's investments will strengthen the core disciplines that empower every step of the process from discovery at the frontier to the development of products, processes, and technologies that fuel the economy. At the same time, NSF's investments will enable increasing connections and cross-fertilization among disciplines.

NSF's focus on a clear set of priorities will help the Nation meet new challenges and take advantage of promising opportunities, while at the same time spurring the growth and prosperity needed to secure the Nation's long-term fiscal balance. The fiscal year 2006 budget will emphasize investments that address established inter-agency research priorities, meet critical needs identified by the science and engineering community, and advance the fundamental knowledge that strengthens the Nation's base of innovation and progress. NSF will respond to these challenges by supporting the best people, ideas, and tools in the science and engineering enterprise, and by employing the best practices in organizational excellence.

RESEARCH AND RELATED ACTIVITIES ACCOUNT

For fiscal year 2006, total funding for NSF's Research and Related Activities account increases by \$113 million—nearly 3 percent—to \$4.33 billion. This increase largely reflects NSF efforts to strengthen fundamental research in the core scientific disciplines as well as promote emerging areas of research. The fiscal year 2006 portfolio balances research in established disciplines with research in emerging areas of opportunity and cross-disciplinary projects. The most fertile opportunities sometimes lie in novel approaches or a collaborative mix of disciplines.

Maintaining a strong and robust core is critical during such a budget climate as certain segments of the academic community rely heavily on NSF funding. In many scientific disciplines, NSF is a major source of Federal funding to academic institutions, including mathematics (77 percent), computer sciences (86 percent), the social sciences (49 percent), the environmental sciences (50 percent), engineering (45 percent) and the physical sciences (39 percent).

Research, however, is only part of the NSF equation. Training the Nation's next generation of scientists and engineers is another key component of NSF's mission, and critical for maintaining economic prosperity and global competitiveness. Here, we are finding ways to leverage our resources. For example, as we strengthen our core disciplinary research programs, we will continue to encourage the types of partnerships between researchers and students that provide hands-on experience while ensuring that future generations gain the skills, knowledge and insight that come from working at the frontier of discovery.

PROVIDING BROADLY ACCESSIBLE CYBERINFRASTRUCTURE AND WORLD-CLASS RESEARCH FACILITIES

Twenty-first century researchers and the students who will bring new skills into the workforce rely on cutting edge tools. In fiscal year 2006, NSF is placing a high priority on investments in cyberinfrastructure and in unique, widely shared research equipment and facilities.

An infrastructure of power grids, telephone systems, roads, bridges and rail lines buttressed this Nation's industrial economy and allowed it to prosper. However, cyberinfrastructure—a networked system of distributed computer information and communication technology—is the lynchpin of today's knowledge based economy. In fiscal year 2006, NSF cyberinfrastructure investments total \$509 million, an increase of \$36 million (7.6 percent) over the fiscal year 2005 level.

Modeling, simulation, visualization, data storage and communication are rapidly transforming all areas of research and education. NSF investments in cyberinfrastructure support a wide mix of projects and encourage participation from broad segments of the research community that rely on such technology as they tackle increasingly complex scientific questions. Thanks to cyberinfrastructure and information systems, today's scientific tool kit includes distributed systems of hardware, software, databases and expertise that can be accessed in person or remotely. In fact, programs such as Teragrid, a multi-year effort to create the world's largest distributed infrastructure for open scientific research, are specifically designed to transcend geographic boundaries and accelerate virtual collaborations.

NSF is also increasing funding for the Major Research Equipment and Facilities Construction by \$76 million or 44 percent, in fiscal year 2006 for a total of \$250 million. There are no new starts, but we will continue to fund ongoing projects. Work will proceed on five major facilities that will serve a spectrum of the science and engineering community. These include world-class astronomy, physics, and geosciences observatories identified as the highest priorities for advancing science and engineering.

- The Atacama Large Millimeter Array (ALMA), in Chile, is a model of international collaboration. It will be the world's largest, most sensitive radio telescope.
- The EarthScope facility is a multi-purpose array of instruments and observatories that will greatly expand the observational capabilities of the Earth Sciences and permit us to advance our understanding of the structure, evolution and dynamics of the North American continent.
- Ice Cube, the world's first high-energy neutrino observatory will be located under the ice at the South Pole.
- RSVP, the Rare Symmetry Violating Processes Project will enable cutting edge physics experiments to study fundamental properties of nature. Studies will probe questions ranging from the origins of our physical world to the nature of dark matter.
- SODV, the Scientific Ocean Drilling Vessel, is a state-of-the-art ship that will be a cornerstone of a new international scientific ocean drilling program. Ocean core sediment and rock collected by the vessel will help investigators explore the planet's geological history and probe changes in the earth's oceans and climate.

Additionally, In fiscal year 2006, NSF will assume the responsibility, from the U.S. Coast Guard, for funding the costs of icebreakers that support scientific research in polar regions; \$48 million was transferred for those purposes.

BROADENING PARTICIPATION

To feed our knowledge-based economy, the Nation needs to capitalize on all of its available talent to produce a workforce of skilled technologists, scientists and engineers. That means developing the largely untapped potential of those underrepresented in the science and engineering workforce—minorities, women and persons with disabilities. It also means supporting science education and training in all regions of the country—not just at large universities or in a handful of States.

To achieve these goals, the Fiscal Year 2006 Request maintains a total investment of almost \$400 million. Funding will be targeted to programs with a proven track record of progress in these areas. Included in this is \$8 million in additional support from the research directorates that will supplement the Education and Human Resources Account to help achieve our goal of broadening science and engineering participation. Working closely with the directorates offers a dual benefit of providing educational opportunities and hands-on research experience to prepare students for the 21st century workforce.

NSF will invest \$396.5 million in a range of programs with proven track records. Several highly successful programs for broadening participation—the Louis Stokes Alliances for Minority Participation, the Alliances for Graduate Education and the Professoriate, the Centers for Research Excellence in Science and Technology (CREST), Robert Noyce Scholarship program, STEM Talent Expansion Program and EPSCoR—just to name a few, are secured in this request. Each of these serve as models for integrating educational and research resources to improve recruitment and retention in science and engineering to all sectors of our diverse population.

SUSTAINING ORGANIZATIONAL EXCELLENCE IN NSF MANAGEMENT PRACTICES

NSF directly supports over 210,000 scientists, educators and students and processes over 40,000 proposals a year. Balancing the needs of a growing, increasingly complex portfolio with new requirements for e-business practices, security, accountability, and award oversight presents a challenge. NSF sets high standards for its business practices and strives to create an agile, innovative organization through state-of-the-art business conduct and continual review. In order to meet these management goals, NSF will be increasing funding for activities that advance organizational excellence by \$46 million, to a total of \$336 million. In addition to critically needed upgrades to our information technology infrastructure, this increase will allow for the recruitment of 25 full-time employees—23 for NSF and one each for the National Science Board and the Office of the Inspector General—which will improve our ability to manage our increasingly complex portfolio.

Expanding our e-government systems and the implementing of our ongoing business analysis recommendations are high priorities for fiscal year 2006.

Over the past 2 years, as part of the administration's Program Assessment Rating Tool, NSF has worked with OMB to rate eight of our investment categories. All of these areas have received the highest rating of Effective. As such, NSF programs fall within the top 15 percent of 600 government programs evaluated to date.

CROSSCUTTING ACTIVITIES

Beyond our budget priorities lie dozens of programs and initiatives that cut across NSF directorates and enrich the overall science and research enterprise. NSF sets priorities based on a continual dialogue and exchange of ideas with the research community, NSF management and staff and the National Science Board. Programs are initiated based on several criteria: intellectual merit, broader impacts of the research, balance across disciplines and synergy with research in other agencies. The Committee of Visitors process ensures a continuous evaluation of our merit review process and feedback on how NSF programs are performing. In fiscal year 2006, NSF will emphasize four crosscutting areas.

Crosscutting Areas of Emerging Opportunity.—Over several years, NSF has funded exceptionally promising interdisciplinary efforts aimed at advancing our knowledge, addressing national needs, and probing the grand challenges of science. The fiscal year 2006 request supports the following priority areas: \$84 million for Bio-complexity in the Environment, \$243 million for Nanoscale Science and Engineering, \$89 million for the Mathematical Sciences Priority Area and \$39 million for Human and Social Dynamics.

International Collaborations.—Science and engineering research are increasingly global endeavors. International partnerships are critical to the United States in maintaining a competitive edge, capitalizing on global opportunities, and addressing global problems. The Office of International Science and Engineering's recent move to the director's office, and the budget request reflects this important trend. The fis-

cal year 2006 budget provides \$35 million for NSF's Office of International Science and Engineering.

The recent Indian Ocean Tsunami disaster represents the finest in international cooperation—and clearly demonstrates an international desire to develop scientific methods for natural disaster prediction and ways to reduce losses when such catastrophic events do inevitably occur. A network of more than 128 sensors—which NSF has a 20-year investment in—recorded shock waves from the recent earthquake as they traveled around the earth. This network is the primary international source of data for earthquake location and tsunami warning and its data forged the critical core of the early knowledge of this event. Within days of the disaster NSF research teams deployed to the region to gather critical data before it was lost to nature and reconstruction. Their work will help scientists and engineers better understand the warning signs of natural disasters, the design of safer coastal structures, the development of early warning and response systems, and effective steps for disaster recovery.

Interagency Initiatives.—NSF will continue to play a lead role in interagency collaborations to address national needs and take advantage of economic growth opportunities. In fiscal year 2006, NSF investments in the National Nanotechnology Initiative increase by \$6 million over fiscal year 2005 levels to total \$344 million. NSF participation in the Networking Information Technology Research and Development initiative will increase to \$803 million—\$8 million over the fiscal year 2005 level. The NSF contribution to the Climate Change Science Program decreases slightly to \$197 million.

Homeland Security Activities.—The Fiscal Year 2006 Request includes a \$2 million increase for government-wide efforts in homeland security research and development. This \$344 million investment will strengthen NSF's commitment to cybersecurity by supporting innovations to secure today's computer and networking systems, embed cybersecurity into future systems and preparing tomorrow's workforce with state-of-the-art security skills.

CONCLUSION

Mr. Chairman, I've only touched upon the variety and richness of the NSF portfolio. NSF research and education efforts contribute greatly to the Nation's innovation economy and help keep America at the forefront of science and engineering. At the same time, NSF supported researchers produce leading edge discoveries that serve society and spark the public's curiosity and interest. Extraordinary discoveries coming from dozens of NSF programs and initiatives are enriching the entire science and engineering enterprise, and making education fun, exciting and achievement-oriented. In fact, just this month, two of the most widely-read and emailed stories from the national press were the discoveries of NSF-supported researchers.

In one, scientists using new bio-bar-code technology created a detection method for a protein implicated in Alzheimer's disease. It's the first test designed for use in living patients and holds promise for diagnosing Alzheimer's at an early stage. In the second development, scientists generated an entirely new classification system for the brains of birds based on recent studies showing that birds are much closer in cognitive ability to mammals than previously thought. The new scheme will affect thousands of scientists, and help merge research efforts on both birds and mammals. These two examples, fresh off the press, illustrate NSF's motto "Where Discoveries Begin."

Mr. Chairman and members of the committee, I hope that this brief overview conveys to you the extent of NSF's commitment to advancing science and technology in the national interest. I am very aware and appreciative of the committee's long-standing bipartisan support for NSF. I look forward to working with you in months ahead, and would be happy to respond to any questions that you have.

PREPARED STATEMENT OF DR. CHRISTINE BOESZ, INSPECTOR GENERAL, NATIONAL SCIENCE FOUNDATION

Chairman Bond, Senator Mikulski, and distinguished members of the subcommittee, I am Dr. Christine Boesz, Inspector General at the National Science Foundation (NSF). I once again appreciate the opportunity to present to you information as you consider NSF's fiscal year 2006 budget request. NSF's work over the past 55 years has had an extraordinary impact on scientific and engineering knowledge, laying the groundwork for technological advances that have shaped our society and fostered the progress needed to secure the Nation's future. Throughout, NSF has maintained a high level of innovation and dedication to American leadership in

the discovery and development of new technologies across the frontiers of science and engineering.

As you know, however, the nature of the scientific enterprise has changed over the past few decades. Consequently, the challenges facing NSF have changed. My office has and will continue to work closely with NSF management to identify and address issues that are important to the success of the National Science Board and NSF. I have now been the Inspector General of NSF for 5 years and am pleased to have the opportunity to work with both Dr. Washington and Dr. Bement, sharing in their vision of a truly successful organization. For the past 4 years, I have testified before this subcommittee on the issues that pose the greatest challenges for NSF management. This year, I will provide an update, from my perspective as Inspector General, on the progress being made at NSF to address the most critical of these challenges.

AWARD ADMINISTRATION

In a given year, NSF spends roughly 90 percent of its appropriated funds on awards for research and education activities. Awarding and managing these grants, cooperative agreements, and contracts is NSF's primary business activity. While NSF has a system for administering its peer review and award disbursement responsibilities, it still lacks a comprehensive, risk-based program for monitoring its grants and cooperative agreements once the money has been awarded.

In response to a reportable condition identified in the Independent Auditors Report for the past 4 years, the agency developed an Award Monitoring and Business Assistance Program Guide that includes post-award monitoring policies and procedures, a systematic risk assessment process for classifying high-risk grantees, and various grantee analysis techniques. NSF also developed an annual grantee-monitoring plan, conducted site visits on selected high-risk grantees, and provided grant-monitoring training for its reviewers. In addition, during the past year, NSF realigned staff and resources to better address this challenge and contracted with a consultant to independently assess its post-award monitoring program.

While these efforts represent positive steps toward an effective award-monitoring program, concerns remain about the limitations of the risk model in identifying all high-risk awards and the adequacy of site visit procedures and the necessary resources provided to the post-award monitoring program. In addition, a recent audit by my office further highlights the need for increased post-award monitoring. My auditors found that a significant number of both annual and final project reports required by the terms and conditions of NSF's grants and cooperative agreements were either submitted late or not at all. This was due in part because of a lack of emphasis placed on the importance of these reports, and because NSF staff do not have the time to adequately address this facet of award administration. In addition, my auditors found that contrary to its policy, NSF has continued to fund some principal investigators who have not yet submitted their final project reports.

But I am encouraged by the results of NSF's consultant's independent assessment of the post-award monitoring program, which contained concerns similar to ours. The consultant's report identifies many opportunities for improvement and recommendations for positive change. Implementing a plan to address these opportunities for improvement would address many of our concerns and would be a significant step for NSF towards successfully meeting this challenge.

MANAGEMENT OF LARGE INFRASTRUCTURE PROJECTS

Throughout my 5-year tenure as Inspector General of NSF, we have considered management of large facility and infrastructure projects to be one of NSF's top management challenges.¹ While this is certainly a subset of award administration, I continue to feel strongly that large facility management warrants independent attention. As you know, NSF has been increasing its investment in large infrastructure

¹Memorandum from Christine C. Boesz, Inspector General, National Science Foundation, to Warren Washington, Chairman, National Science Board, and Arden Bement, Acting Director, National Science Foundation (Oct. 15, 2004); Memorandum from Christine C. Boesz, Inspector General, National Science Foundation, to Warren Washington, Chairman, National Science Board, and Rita R. Colwell, Director, National Science Foundation (Oct. 17, 2003); Memorandum from Christine C. Boesz, Inspector General, National Science Foundation, to Warren Washington, Chairman, National Science Board, and Rita R. Colwell, Director, National Science Foundation (Dec. 23, 2002); Memorandum from Christine C. Boesz, Inspector General, National Science Foundation, to Eamon M. Kelly, Chairman, National Science Board, and Rita R. Colwell, Director, National Science Foundation (Jan. 30, 2002); Letter from Christine C. Boesz, Inspector General, National Science Foundation, to Senator Fred Thompson, Chairman, Senate Committee on Governmental Affairs (Nov. 30, 2000).

projects such as accelerators, telescopes, research vessels and aircraft, supercomputers, digital libraries, and earthquake simulators. Many of these projects are large in scale, require complex instrumentation, and involve partnerships with other Federal agencies, international science organizations, and foreign governments. Some, such as the construction of the new South Pole Station, present additional challenges because they are located in harsh and remote environments.

As I have testified in the past, the management of these awards is inherently different from the bulk of awards that NSF makes. While oversight of the construction and operations of these large facility projects must always be sensitive to the scientific endeavor, it also requires a different set of management skills for the NSF staff involved. It requires expertise in the construction and oversight of large facilities; close attention to tracking costs and meeting deadlines; and effective coordination with scientists, engineers, project managers, and financial analysts. Although NSF does not directly operate these facilities, it is ultimately responsible and accountable for their success. Consequently, it is vital that NSF, through disciplined project management, exercise proper stewardship over the public funds invested in these large projects.

In fiscal years 2001 and 2002, my office issued two audit reports on large facilities with findings and recommendations aimed at improving NSF's management of these projects.² Primarily, our recommendations were aimed at (1) increasing NSF's level of oversight with particular attention to updating and developing policies and procedures to assist NSF managers in project administration, and (2) ensuring that accurate and complete information on the total costs of major research equipment and facilities is available to decision makers, including the National Science Board, which is responsible for not only approving the funding for these large projects, but also setting the relative priorities for their funding.

NSF continues to make gradual progress towards addressing the reports' recommendations. The most significant progress was the hiring of a new Deputy Director for Large Facility Projects. During the past year, NSF has made further progress by providing this Deputy Director with 1.5 FTE's, which allowed him to begin to develop the detailed guidance needed by program officers to adequately manage their large facility projects. Among numerous duties related to large facility project management, the Deputy Director chairs a facilities panel that has responsibility for approving management plans for projects, and he receives periodic reports on active projects.

However, the Large Facility Projects Office continues to face a number of obstacles to successfully implementing a viable large facility management and oversight program. To enable this Office to develop a more influential role, NSF's senior management must clearly recognize and champion the Large Facility Projects Office's oversight responsibility, and provide it with the independent authority and resources to handle it. These resources need to include funding for staff, contract support, travel, and other necessary resources. Without this management framework, the role of NSF's Large Facility Projects Office is likely to remain one that is primarily advisory and collaborative, rather than one that has a formal charge to substantively and positively influence project management decisions.

STRATEGIC MANAGEMENT OF HUMAN CAPITAL

While the previous two management challenges are of an ongoing and urgent nature, they may be symptomatic of a larger, more pressing need for improved strategic management of NSF's human capital. In order to fully address its award management challenges, NSF will need to devote more resources and attention to making business and process improvements, while at the same time, planning for its future workforce needs. Although advances in technology have enhanced the workforce's productivity, NSF's rapidly increasing workload has forced the agency to become increasingly dependent on temporary staff and contractors to handle the additional work. NSF's efforts in the past to justify an increase in staff have been impeded by the lack of a comprehensive workforce plan that identifies workforce gaps and outlines specific actions for addressing them. Without such a plan, NSF cannot determine whether it has the appropriate number of people or the types of competencies necessary to accomplish its strategic goals.

NSF has recognized the seriousness of this challenge and, as I testified last year, has now identified investment in human capital and business processes, along with

²Office of Inspector General, National Science Foundation, Audit of the Financial Management of the Gemini Project, Report No. 01-2001 (Dec. 15, 2000); Office of Inspector General, National Science Foundation, Audit of Funding for Major Research Equipment and Facilities, Report No. 02-2007 (May 1, 2002).

technologies and tools, as objectives underlying its new Organizational Excellence strategic goal.³ NSF also contracted in fiscal year 2002 for a comprehensive, \$14.8 million, 3- to 4-year business analysis, which includes a component for a Human Capital Management Plan. Preliminary assessments provided by the contractor confirmed that NSF's workforce planning to date has been limited and identify specific opportunities for NSF to improve in this area. NSF's Human Capital Management Plan, which was delivered in December 2003, links Human Capital activities to the NSF business plan and to the Human Capital Assessment and Accountability Framework provided by the Office of Personnel Management. While the current plan provides a roadmap for identifying NSF's future workforce needs, the needs themselves are still in the process of being defined. I continue to believe NSF cannot afford to wait long to address its workforce issues. If not adequately resolved, these issues will undermine NSF's efforts to confront its other pressing management challenges and to achieve its strategic goal of Organizational Excellence.

NSF's reliance on "non-permanent" personnel is another area of concern. Forty-seven percent of NSF's 700 science and engineering staff are either visiting personnel, temporary employees, or intermittent employees. Visiting personnel make an important contribution to NSF's mission by enabling the agency to refresh and supplement the knowledge base of its permanent professional staff. But managers who serve at NSF on a temporary basis frequently lack institutional knowledge and are less likely or able to make long-term planning a priority. Moreover, there are substantial administrative costs that NSF incurs in recruiting, hiring, processing, and training personnel that rotate every 1 to 4 years. In fiscal year 2004, my office conducted an audit that identified the additional salary, fringe benefits, travel and other costs of visiting or temporary personnel, and found three areas where NSF could improve its administration of the programs.⁴ In short, while visiting personnel are an important resource for NSF, the agency must continually balance the benefits of their services against the additional costs involved.

In conclusion I would like to comment briefly on my office's fiscal year 2006 budget request of \$11.5 million. Although this request represents a \$1.47 million (14.7 percent) increase over the Fiscal Year 2005 Current Plan, the increase is primarily to fund the annual audit of NSF's financial statements, which previously has been provided through NSF's appropriations. The contract for this audit will be re-competed in 2005, and we anticipate that its cost in fiscal year 2006 will increase dramatically, consuming 75 percent or more of our total requested increase.⁵ The bulk of the remaining increase will be applied towards the expected pay increase for civilian personnel.

My office will continue to focus its audit attention on NSF's most pressing management challenges, some of which I have described for you today. In addition, we will also maintain a focus on specific issues that emerge concerning the management of NSF programs, procurement and acquisition, information technology, human capital, awardee financial accountability and compliance, and OMB Circular A-133 audits. We have recently made a strong commitment to improving the quality of audits conducted by our contract CPA firms, and the increase in time and effort required to meet the higher standards is significantly raising the costs of contracted audits.⁶ In recent years, these audits have uncovered material issues concerning unallowable indirect costs, unfunded cost-sharing commitments, and records maintained by large school systems that were so inadequate they could not be audited. It is likely that the continuing increase in costs may result in a reduction in the number of contracted audits in fiscal year 2006. We will also have to more gradually phase in our assessments of NSF actions resulting from the agency's multiyear business analysis contract and workforce plan, which are scheduled for completion in fiscal year 2005. Finally, while we will be able to initiate an audit on international collaborations, which are an integral part of NSF's portfolio, with particular attention to the accountability and audit requirements of international partners, major efforts in this area may also have to be phased in.

³National Science Foundation, Strategic Plan Fiscal Year 2003-Fiscal Year 2008 (Sept. 30, 2003) <http://www.nsf.gov/od/gpra/Strategic_Plan/fiscal_year_2003-2008.pdf>.

⁴Office of Inspector General, National Science Foundation, Audit of Costs Associated with Visiting Personnel, Report No. 04-2006 (July 23, 2004). Opportunities for improvement cited in the report include consulting income documentation, IPA pay computations, and VSEE cost of living adjustments.

⁵Our survey of the current audit market shows that audit costs in general are on the rise because of Sarbanes-Oxley and other government requirements. While the audit cost \$800,700 in fiscal year 2004 and is projected to be \$855,800 in fiscal year 2005, the audit under a new contract is expected to exceed \$1.0 million in fiscal year 2006.

⁶Most contract CPA audits currently range from \$67,000 to \$160,000.

Mr. Chairman, this concludes my written statement. I would be happy to answer any additional questions you or other members of the subcommittee may have, or to elaborate on any of the issues that I have addressed today.

NATIONAL SCIENCE BOARD

STATEMENT OF DR. WARREN M. WASHINGTON, CHAIRMAN

Senator BOND. Dr. Washington.

Dr. WASHINGTON. Mr. Chairman Bond, Senator Mikulski, and Senator Stevens, I appreciate the opportunity to testify before you. My testimony today is in my capacity as Chairman of the National Science Board.

On behalf of the Board and the widespread community involved in various aspects of education, as well as research, I want to thank the Senate for the long-term commitment to the investments in science, engineering, mathematics, technology, and education.

The Board greatly appreciates the Senate's very prompt action in confirming eight new members of the Board and the NSF Director.

The Congress established the National Science Board in 1950 and gave it dual responsibilities: First, oversight of activities and establishing policies for the National Science Foundation and second, serving as an independent national science body to render advice to the President and Congress on policy issues related to science and engineering research and education.

During our recent Board Retreat, which was only a week or so ago, the Board re-affirmed their strong commitment to fulfilling our obligations. The Board members, including the NSF Director, discussed the important role of the Board in establishing a new vision and setting priorities for the Foundation.

The Board has reviewed and approved the NSF fiscal year 2006 budget request that was submitted to OMB in September 2004, and we generally support the President's budget request.

We are certain that members of this subcommittee fully understand the unique and long-term value of NSF programs to ensure the future economic health of our Nation, to maintain U.S. pre-eminence in discovery and innovation, and to provide valuable contributions to homeland security efforts.

The Board fully supports the fiscal year 2006 budget focus on the four funding priorities that address current national challenges, as well as making NSF's core portfolio of research investment even stronger.

Should additional funds beyond the administration's request be made available to NSF, the Board has these following recommendations: to more strongly support the investment in science and engineering education, to address the backlog of Board-approved major research equipment and facilities construction projects, and to address the additional financial burden to the Foundation related to the transfer of financial responsibility for ice-breaker ships from the Coast Guard to the NSF.

I would like to briefly highlight some of the Board's accomplishments last year. Regarding the large research facilities, we are in the process of developing and implementing the setting of priorities for the MREFC projects, and we have approved a draft of "Setting Priorities for Large Research Facility Projects Supported by the National Science Foundation" report. And we are now seeking

input from the larger community about that report, and we expect full implementation of the revised process by the fall.

The Board has examined the policies and the positions that came out of the NAPA report—those have to do with the Sunshine Act, the use of IPA's and other employees who rotate in and out of the Foundation, the appointment process of the NSF Inspector General, and the role of the Board in oversight and setting policies for NSF.

During this year, the Board will begin a revision of our strategic plan with a focus on vision and long-term goals for NSF, while working with the NSF management to set clear, near-term priorities for the Foundation that are linked to budget realities.

At the request of Congress, we will also be carrying out an examination of the NSF Merit Review System and report our initial findings before the end of this fiscal year.

PREPARED STATEMENT

The Board is going to be examining long-lived data collections, how to support transformative research more effectively, and how to ensure an adequate and diverse S&E work force for the future.

We will also be examining our investments in NSF centers versus PI-type grants.

I thank you very much, and I will be happy to answer any questions.

Senator BOND. Thank you very much, Dr. Washington.

[The statement follows:]

PREPARED STATEMENT OF DR. WARREN M. WASHINGTON

Chairman Bond, Senator Mikulski, and members of the committee, I appreciate the opportunity to testify before you. I am Warren Washington, Senior Scientist and Section Head of the Climate Change Research Section at the National Center for Atmospheric Research. My testimony today is in my capacity as the Chairman of the National Science Board (the Board, NSB).

On behalf of the Board and the widespread and diverse research and education communities that we all serve, I thank the Senate for its long-term commitment to a broad portfolio of investments in science, engineering, mathematics, and technology research and education.

The Congress established the National Science Board in 1950 and gave it dual responsibilities:

- oversee the activities of, and establish the policies for, the National Science Foundation (the Foundation, NSF); and
- serve as an independent national science policy body to render advice to the President and the Congress on policy issues related to science and engineering research and education.

The Board greatly appreciates the Senate's very prompt action in confirming eight new NSB Members and the NSF Director before our December 2004 meeting. This Senate action allowed the Board to move forward with our new Members able to participate fully in addressing the Board's demanding responsibilities.

I would like to provide some general comments regarding the NSF fiscal year 2006 budget request, then update you on National Science Board activities over the last year and some of our priorities for the coming year.

FISCAL YEAR 2006 NSF BUDGET REQUEST

The National Science Board has reviewed and approved NSF's fiscal year 2006 budget request that was submitted to the Office of Management and Budget (OMB) in September 2004, and we generally support the President's budget request before you today. Given the overall cut to non-defense domestic discretionary spending, the Board respects and appreciates that the President's budget request recognizes the importance of returning NSF to positive growth. We are cognizant of the current Federal fiscal constraints that our Nation faces and that there are many worthy

competing interests for a limited resource. However, we are also certain that the members of this Senate Appropriations Subcommittee fully understand the unique and long-term value of NSF programs in science and engineering research and education to ensuring the future economic health of our Nation, maintaining U.S. preeminence in discovery and innovation, and providing valuable contributions to homeland security efforts.

The Board fully supports the fiscal year 2006 NSF budget focus on the four funding priorities that address current national challenges as well as strengthening the core portfolio's of NSF's research investment. We also recognize that a budget request of \$5.605 billion, representing a 2.4 percent increase over NSF's fiscal year 2005 budget, is a significant investment in NSF programs in a time of national fiscal austerity. Nevertheless, it is incumbent on the Board to note that this request remains below the level of the 2004 NSF operating budget.

Should this subcommittee determine that additional funds, beyond the administration's request, can be made available to NSF in fiscal year 2006, the National Science Board would recommend support for a strong and growing role for the NSF in the Nation's investment in science and engineering (S&E) education, addressing the backlog of Board approved and prioritized Major Research Equipment and Facilities Construction (MREFC) projects, and addressing the financial burden to the Foundation related to the transfer of financial responsibility for icebreaker ships from the Coast Guard to the NSF.

Adequate preparation of future participants in the U.S. workforce, at all levels of education, will require increasing mathematics and science understanding and skills if the United States is to sustain global preeminence in S&T. The Board has underscored its concern about the poor performance of U.S. citizens in essential knowledge and skill areas in science, technology, engineering, and mathematics (STEM) fields, in comparison with other high technology countries. It is impossible to conclude that growth in our national capabilities can occur without continual enhancement of the skills of our workforce. We have relied too heavily on attracting international students and professionals to meet our workforce needs, and, as a result, we need to do a better job of preparing U.S. students for joining the S&E workforce. Other nations are competing with the United States for the best international students and most accomplished S&E professionals. We must recognize the critical challenge our Nation now faces in sustaining a U.S. science and technologies (S&T) workforce that will be competitive over the long term in an increasingly global and competitive S&T environment.

The Board fully supports the proposed fiscal year 2006 funding for MREFC projects, and appreciates the significant increase in funding for this budget category. Members of the Senate Appropriations Subcommittee are aware of the exciting opportunities at the frontiers of knowledge that we are unable to pursue without the cutting edge facilities that are funded under this account. While funding for ongoing MREFC projects is the highest priority for the Board, the lack of implementing any new projects in fiscal year 2006 will increase the concern of the science community that the United States is losing its ability to sustain cutting edge S&E research. Should additional funding for MREFC projects be available, the Board recommends, in priority order, support for Ocean Observatories and the Alaska Regional Research Vessel.

The third area for which the Board would recommend any additional NSF funding be allocated is appropriate support for the costs that NSF will incur with the transfer of financial responsibility for icebreaking activities previously supported by U.S. Coast Guard. The administration's fiscal year 2006 NSF budget request allocated \$48 million. The Board is very concerned that the true costs to NSF for these new responsibilities will be greatly more than \$48 million and will, therefore, drain resources from NSF research and related activities. We understand that a new NSF-Coast Guard Joint Working Group is discussing various options for dealing with this issue. In addition, we also understand that the National Academies Polar Research Board is studying this issue and expects to provide an interim report in September 2005. When these two groups have completed their discussions and assessments, we urge Congress to factor their conclusions into any final budget decisions and provide adequate funding to fully support this new NSF responsibility.

Again, the NSB supports the integrated portfolio of investments in S&E research and education represented in the NSF fiscal year 2006 budget proposal. It thoughtfully blends support for the core disciplines with encouragement for interdisciplinary initiatives, brings together people from diverse and complementary backgrounds, provides infrastructure for research and STEM education, and strengthens the NSF's management of the enterprise.

Further, in this time of National emergency, this budget for NSF continues to foster S&T that enhances our homeland security. NSF activities in this area include

Critical Infrastructure Protection, Research to Combat Bioterrorism, Cybercorps/Scholarships for Service, Counterterrorism, and Physical/Information Technology Security. Of course, by enabling future discovery and innovation, NSF supports our Nation's long-term prosperity and economy security.

OVERVIEW OF NSB ACTIVITIES DURING THE LAST YEAR

During the last calendar year, even while going through a continuing evolution in terms of its operation, the Board has accomplished a great deal in terms of our mission to provide oversight and policy direction to the Foundation.

I would like to briefly highlight some of these accomplishments, but will not attempt to discuss them all here.

In terms of providing oversight for the Foundation, the Board has:

- reviewed and endorsed the Office of Inspector General Semi-annual Reports to Congress, and approved NSF management responses;
- approved the NSF fiscal year 2006 budget request for transmittal to OMB;
- reviewed the Foundation's report on its merit review system;
- provided review and decisions on nine major awards or proposal funding requests;
- developed and implemented a Board process for re-prioritization of all Board approved, but not yet funded, MREFC projects; and
- provisionally approved the report "Setting Priorities for Large Research Facility Projects Supported by the National Science Foundation" (NSB/CPP-04-20).

The Board and Foundation are implementing the principles of the revised process described in this provisionally approved document for the fiscal year 2006 budget. At the same time, the Board Office has implemented an extensive outreach effort to invite comments from nearly 400 individuals and organizations that would be expected to have particular interest in large facilities. We expect final revisions based on this additional review and input, Board approval of all revised procedures and policies, and full implementation of the revised process over the next few months.

With respect to providing policy direction to the Foundation, the Board has:

- approved a report on "Broadening Participation in Science and Engineering Faculty" (NSB 04-41) that addresses the need to increase the diversity of this component of the S&E workforce to more nearly reflect the diversity of the student body it serves, and
 - approved elimination of agency requirements for cost sharing, beginning this year (2005), while retaining the 1 percent statutory cost-sharing requirement.
- In terms of advice to the President and the Congress, the Board has:
- published and distributed widely "Science and Engineering Indicators 2004", the 16th volume of this statutory, biennial series and initiated the "Science and Engineering Indicator 2006" report;
 - published a policy statement accompanying Indicators 2004, "An Emerging and Critical Problem of the Science and Engineering Labor Force" (NSB 04-07), which draws attention to the disturbing long-term trends in U.S. education and the globalization of S&T that, if ignored, may result in a loss of U.S. leadership in innovation and high technology;
 - approved the draft report on "Long Lived Data Collections: Enabling Research and Education in the 21st Century" (NSB/CPP-04-21);
 - reported to the Congress on Delegation of Authority in accordance with Section 14 of the NSF Act of 2002;
 - responded to four specific IPA-related questions that NSB's Executive Officer received from House Appropriations Subcommittee for VA, HUD, and Independent Agencies;
 - published and disseminated "Fulfilling the Promise: A Report to Congress on the Budgetary and Programmatic Expansion of the National Science Foundation" (NSB-03-151);
 - provided testimony to congressional hearings;
 - interacted with Office of Science and Technology Policy (OSTP) and OMB on NSF and S&E issues;
 - provided briefings and presentations to the Congress and other policy organizations concerning the Board's reports and statements; and
 - responded to specific questions and inquiries from Senators and Representatives.

In an effort to facilitate more openness of Board meetings in accord with the Sunshine Act, we expanded our practices for:

- providing public notice of all our meetings in press releases, the Federal Register, and the NSB Web site;
- treating teleconferences of committees as open meetings;

- providing much more information to the public in a more timely manner regarding meeting discussions and decisions; and
- encouraging public comment during the development of Board publications.

Also, this past year the Board:

- examined our policies and positions relevant to the recommendations of the National Academy of Public Administration report concerning the Board's implementation of the Sunshine Act, the use of Intergovernmental Personnel Act (IPA) employees and other rotators at NSF, the oversight of the NSF Inspector General, and the role of the National Science Board in oversight and setting policies for NSF;
- began implementing recommendations of the Office of Inspector General to continue enhancing our procedures and policies related to compliance with the Sunshine Act; and
- significantly increased and improved our direct outreach and communication with OMB, OSTP, Congress, other Federal agencies, various interest groups and the outside S&E research and education community.

To that end, the Board Office is contracting to develop monitoring and evaluation tools, to expand outreach, and measure the impacts of NSB statements, resolutions and reports; and to redesign the NSB Web site for greater accessibility and utility to the public.

One thematic area of significant accomplishment was transformative or "high risk" research where the Board organized a Workshop on "Identifying, Reviewing, and Funding Transformative Research" and established within the Committee on Programs and Plans a Task Force on Transformative Research. Another thematic area of accomplishment this year was long-lived data collections where the NSB established within the Committee on Programs and Plans a Task Force on Long-Lived Data Collections; and prepared a draft report, "Long-Lived Data Collections: Enabling Research and Education in the 21st Century" (NSB/CPP-04-21).

The year 2004 also saw the Board's examination of NSF issues related to broadening participation in S&E; as well as efforts toward obtaining industry perspectives on workforce issues. The Board has also continued its recognition of outstanding science, engineering and science education accomplishments through the Vannevar Bush Award, Alan T. Waterman Award, and Public Service Awards.

FISCAL YEAR 2006 NSB BUDGET

The administration's Fiscal Year 2006 Budget Request of \$4.0 million for the NSB will be adequate to support Board operations and activities during fiscal year 2006. The request seeks resources to carry out the Board's statutory authority and to strengthen its oversight responsibilities for the Foundation. We expect that the Foundation will continue to provide accounting, logistical and other necessary resources in support of the NSB and its missions, including expert senior S&E staff serving as a cadre of executive secretaries to Board committees and task forces.

At the urging of Congress, in fiscal year 2003 the Board began examining options for augmenting its professional staffing levels. At its May 2003 meeting, the Board decided to begin a process to assess the feasibility of recruiting for positions that would broaden its policy support, provide additional legal advice, and enhance the Board's capabilities in advanced information technology. The Board Office has continued to implement the staff enhancement plan, adding four positions this fiscal year for support staff, including information technology staff, science assistants, national awards assistant, and filling the vacancy for an editor/writer. The Board Office will be recruiting two senior professionals to provide policy and legal support to the Board this year. The Board is very pleased with the progress of the staff enhancement process.

The NSB Office staff provides the independent resources and capabilities for coordinating and implementing S&E policy analyses and development. It also provides operational support essential for the Board to fulfill its mission. By statute, the Board is authorized five professional positions and other clerical staff as necessary. In consultation with the Congress, the Board has defined these professional positions as NSB senior S&E policy staff, and the clerical and technical positions as NSB staff that support Board operations and related activities. The full impact of increasing the number of professional positions closer to the statutory level is expected to occur in fiscal year 2005, emphasizing a broadening of professional skills to support the Board.

In addition to the NSB Office's essential and independent resources and capabilities, external advisory and other services are especially critical to support production of NSB reports, and supplement the NSB staff's general research and administration services to the Board. These external services provide the Board and its Of-

face with the flexibility to respond independently, accurately and quickly to requests from Congress and the President, and to address issues raised by the Board itself.

In fiscal year 2006, the Board will expand its ongoing examinations of its role and responsibilities regarding the NSF's MREFC programs as it finalizes the development and implementation of a new protocol for the process by which major research equipment and facilities proposals are developed, prioritized, and funded; NSF policies for Long-lived Data Collections; NSF policies regarding the identification, development and funding of transformative "high risk" research; and policies to ensure an adequate and diverse S&E workforce for the future.

The Board will continue to review and approve NSF's actions for creating major NSF programs and funding large projects. Special attention will be paid to impacts of budget constraints on the S&T workforce, broadening participation in higher education, national S&T infrastructure, and the size and duration of NSF grants.

Effective communications and interactions with our constituencies contribute to the Board's work of identifying priority S&T policy issues, and developing policy advice and recommendations to the President and Congress. To this end, the Board will increase communication and outreach with the university, industry and the broader S&E research and education community, Congress, Federal S&T agencies, and the public. These activities will support U.S. global leadership in discovery and innovation based on a continually expanding and evolving S&T enterprise in this country, and will insure a principal role for NSF programs in providing a critical foundation for S&E research and education.

With our new Board Members, new openness, and new modes of operations, the Board has much to do in 2005. However the most daunting challenge we face is making the tough choices and prioritizing NSF programs and projects in the face of constrained Federal budgets and a growing competition for those funds.

CLOSING REMARKS

This is a difficult time for Federal budgets for S&E research and education and the institutions and individuals in the nonprofit and public sectors that rely on Federal support. For over 50 years the Federal Government has sustained a continual, visionary investment in the U.S. research and education enterprise in the expectation that such investment would redound to the benefit of all Americans. That Federal effort has expanded the horizon of scientific discovery and engineering achievements far and wide, leading to the realization of enormous benefits to our Nation and, indeed, all of humanity.

In recognition of the Federal fiscal realities our Nation faces, the National Science Board pledges that we will be a force for causing the NSF to set priorities, to make hard programmatic budget decisions and, as a result, to obtain the most benefits from the funds provided. However, even in a time of budget constraints, as a Nation we cannot ignore our growing dependence as a society on innovation for economic prosperity and the ever-improving quality of life Americans have come to expect. The Federal compact in research and education with the nonprofit sectors is an essential pillar of our Nation's global dominance in S&T.

We know what works—we have a very long history of success to draw on. We know the expanding frontiers of knowledge offer enormous opportunities for research and innovation. We also know that the education of all our citizens in the fundamentals of math, science and engineering must be addressed if the United States is to remain eminent in S&T when we enter the 22nd century. As other nations ramp up their investment in the infrastructure for S&E research and innovation, we cannot be complacent. The Federal investment in the Nation's S&T is a necessity for the Nation's future prosperity and security. The United States must sustain its advantages through continued wise, adequate Federal support for our S&E enterprise.

Senator BOND. I am now going to turn to Senator Mikulski for her opening statement and questions. Then we will turn to Senator Stevens, our President pro tem, for his comments and questions. Senator Mikulski.

STATEMENT OF SENATOR BARBARA A. MIKULSKI

Senator MIKULSKI. Thank you very much. Good morning to everybody.

Senator Bond and Senator Stevens, we know that we have a full appropriations hearing with Secretary Rice. So I am going to ask unanimous consent that my opening statement go into the record.

Senator BOND. Without objection.

Senator MIKULSKI. I want to make two points about it before I go into questions.

First of all, to our panel here today and all in the scientific community, I think we noted the passing of Dr. Bromley, who was a Science Advisor to President Bush's father, that this subcommittee worked so closely with. He was a great person to work with and I would just like to acknowledge his passing and hope we would all hold him in our heart and just to also acknowledge when we can work together on a bipartisan basis and nonpartisan—see, I think science should be nonpartisan. You know, science belongs to America, not to a particular party. So we just want to note that.

Coming back, though, as we look at the budget, I must say I am deeply disturbed about it. Senator Bond has said that 2 percent is really 1 percent. Let us say it is 2 percent for the sake of conversation. That would mean our mutual goal of doubling the National Science Foundation budget, which is in law, signed by President Bush, would take, at this current funding, 36 years. Thirty-six years. That would take us to 2040.

Now, I think that America cannot wait. If we are going to have an innovation economy, which you support, we need to be able to have this, I believe, on a more robust path, focusing on certainly the four goals that you have outlined. They are exactly, I think, the national goals.

Really, it is two broad-based functions. No. 1, research. Unlike NIH and some of the others and our great Federal labs, academia will tell us, as you know, that it is the National Science Foundation that funds the basic research that leads to the basic breakthroughs that lead to the new ideas that lead to the new technologies. So, that has to be our mission.

And then the other is education. Where is the next generation of scientists and technology? We do not have a work force shortage. We do not have a talent shortage. We have to make sure we do not have an opportunity shortage when we look at a variety of levels of education. I know Senator Bond will be talking very much about the education budget.

PREPARED STATEMENT

Before I go to my questions, I just wanted to make those points. Should we yield to Senator Stevens and then go to your questions and come back?

[The statement follows:]

PREPARED STATEMENT OF SENATOR BARBARA A. MIKULSKI

Welcome Dr. Marburger, Dr. Bement and Dr. Washington. I want to thank Senator Bond for holding this hearing. I am glad we are moving forward with our work.

The proposed budget for NSF is just 2.4 percent above last year for a total of \$5,605,000,000. This barely keeps pace with inflation. Most disturbing is the cut to education programs. This budget actually cuts education programs by 12 percent and research is increased by almost 3 percent which barely keeps pace with inflation. Yet, salaries and expenses go up by 20.5 percent, and major equipment goes up by 44 percent. I do not doubt the value, need, or resources devoted to major

equipment but when every other part of the NSF budget is starved for resources, a huge increase like that stands out.

Senator Bond and I are committed to doubling the NSF budget over 5 years. We have increased NSF's budget by an average of 10 percent over the President's budget for the last several years. This administration has broken its promise to NSF. In 2002, the President signed the NSF Authorization into law. It authorized a doubling of the NSF budget between 2002 and 2007. In 2006, NSF is authorized to be funded at \$8,500,000,000. Yet the President's 2006 budget funds NSF at \$5,605,000,000—34 percent below where it should be.

Not only does this budget fail to double the NSF budget in 5 years, it actually cuts education programs by 12 percent. How can we raise test scores if we are cutting the very programs that are designed to raise test scores? A recent international study found that U.S. fourth grade students in mathematics came in 12th place—just behind Hungary. We are falling behind in innovation, job creation and education and this budget does nothing to address any of these issues.

Teacher training programs are cut by 35 percent. K–12 education programs are cut by 23 percent. How can we train the next generation of teachers, and how can we prepare the 21st century workforce, when we are cutting the very programs that address this problem?

Every major report on long term U.S. economic competitiveness has cited the need for a large increase in research—basic research into the physical sciences (physics, chemistry), and strategic research (nano, bio and info tech). It used to be we won the Nobel Prizes and other countries won market share. That was bad enough. Now, we are even falling behind in our Nobel Prizes. After peaking in the 1990's, the American share of Nobel Prizes is now falling for the first time in over 40 years. America's share of patents is also falling while patents granted to researchers in other countries is increasing. India, China, Japan, Korea—these are the countries we are competing against. Innovation is the key to economic growth and the Federal Government must take the lead but this budget fails to make the investment we need to innovate.

Community Colleges should be at the forefront of training a high tech workforce. Yet, this budget cuts funding for community colleges. We should be increasing funding for community colleges, not decreasing it.

The Tech Talent program which was started by this subcommittee and was designed to produce more math, science and engineering students, was cut. Again, we see a pattern of cutting education programs that address our most fundamental competitiveness and workforce development needs.

If we are going to increase minority participation in the sciences, then we have to start with our Historically Black Colleges and Universities. In my own State of Maryland, I am proud to represent Morgan State, Bowie State and the University of Maryland, Eastern Shore.

Fortunately, graduate stipends, which I lead the fight to raise, remain at the \$30,000 level.

I am also pleased to see a proposal for an expanded Tsunami warning system. We know that NOAA and the U.S. Geological Survey are the lead agencies but we look forward to hearing about NSF's role and other agencies that are participating in this program.

Finally, I believe it is time to renew our commitment to oceans research. The U.S. Commission on Ocean Policy, chaired by Admiral Watkins, has given us an outstanding set of recommendations to pursue.

Unfortunately, with a flat budget, cuts to education, workforce development and no real increase in research, the promise of innovation will be delayed. Other countries will continue to accelerate their commitment to research and development. The jobs of tomorrow depend upon the research of today. Unless we increase our commitment to workforce training, education and research, we will fall behind the rest of the world.

Senator BOND. That is a very generous idea. Senator Stevens.

Senator STEVENS. Thank you very much.

Senator MIKULSKI. But that is the direction I am going to be going in.

BARROW ARCTIC RESEARCH CENTER

Senator STEVENS. I do want to move on to the other committee and get prepared for that too.

I only have one question. I am particularly talking to Dr. Bement. Alaska is the one place in the United States that really has shown the early effects of global climate change. We have plants growing further north. We have timber growing further north. The permafrost is thinner. We have the offshore ice that is thinner, if not gone. We have changes in some of the ocean mammals. We have considerable inundation of coastal villages, if not destruction of many.

In 2004, I asked Congress to provide \$5.8 million to NSF to reconstruct the Barrow Arctic Research Center. You have not spent a dime of it. Why?

Dr. BEMENT. Well, I had the impression that was in NOAA's budget. We have been working with Admiral Lautenbacher—

Senator STEVENS. That was Science Foundation money that I earmarked as chairman of the committee, \$5.8 million. Not one word from you since then.

I do not want to embarrass you. I would ask you to give us a report because I think that is really a terrible situation when this area is the worst hit in the United States, and we cannot restore that center. The industry wants it. The State wants it. The science community wants it. It is the central location to try and study what is going on up there. You used to have a center there and the Navy was part of it then. I think you took it over after the Navy and then closed it down.

Dr. BEMENT. Well, Senator, let me report to you that we are working on the Barrow Center. We have invested in the Barrow Center. We have a plan. We have implemented every element of the plan to date. I have met with NOAA executives, Admiral Lautenbacher. We are trying to develop a joint plan to fully fit out that center. That plan is currently in progress and we will have a report to you as quickly as we can put it together.

Senator STEVENS. Good. I thank you very much.

Thank you very much, Senators.

Senator BOND. Thank you, Senator Stevens.

NATIONAL SCIENCE BOARD LONG-TERM VISION

Let me ask two quick questions and I am going to turn it back to Senator Mikulski for her questions. First, Dr. Washington, as I stated in my opening remarks, I think the Science Board has to develop a long-term vision, and I think the Board is perfectly suited to do that. I agree with Dr. Marburger's statement that tight budgets have the virtue of focusing on priorities. So does a hanging in a fortnight.

But I hope we are not in that bad a condition, but developing a clear strategy is critical so that we are focused on limited funds.

May I have your commitment that you will have the Board immediately begin working on this matter? And how soon can the Board tackle it and when can you get it done?

Dr. WASHINGTON. At the retreat that we had just a couple weeks ago, we did extensively talk about updating and coming up with a new strategic plan. You have my assurance that I will make this a high priority for next year.

Senator BOND. How about a date? When will we have it?

Dr. WASHINGTON. Hopefully we can have it by December. Now, you know I have 24 members and——

Senator BOND. Well, tell the 24 members that Senator Mikulski and I——

Senator MIKULSKI. And 48 opinions.

Senator BOND. You are scientists, not economists. We do not have one on the one hand and on the other hand.

Dr. WASHINGTON. Yes.

Senator BOND. December, okay.

MANAGEMENT AND OVERSIGHT OF LARGE FACILITIES

Next, Dr. Bement and then Dr. Washington. The IG's statement for the record on the slow progress in addressing management and oversight of large research facility projects was disappointing. I think we understand you have a very good Deputy Director in Mark Coles. But I get the sense that he is not being utilized adequately as recommended.

And I have three problems we would like you to fix immediately: No. 1, changing the roles and responsibilities of the LFP office so that they are authoritative and independent as originally intended, rather than advisory and collaborative.

No. 2, the LFP needs resources. I understand you have begun addressing this and I applaud you but the current 1.5 FTE's are not going to cut the mustard given the complexity of the projects. I would suggest that even more resources be made available, maybe 5.

No. 3, we ask that you ensure your systems can act quickly, track the cost of these projects so there is accountability. That is one thing that drives us nuts.

So I would like your commitment today that you will take action on these recommendations and I would ask Dr. Washington as part of the Board's oversight role to hold the Science Foundation accountable for implementing it. Dr. Bement.

Dr. BEMENT. Senator, we take guidance from the Inspector General quite seriously. On the other hand, there were some things I believe the Inspector General did not take into account.

First of all, I hold myself accountable for our large facilities management and I take that responsibility very seriously. I rely on Mark Coles to be my early warning system to advise me on things going right and things going wrong. He has my complete confidence and has full responsibility for oversight.

But the Inspector General did not take into account that he has access to 127 people in the budget and finance office to do full cost accounting, which is currently being implemented.

Now, in addition to that, we have under contract—so he has access to contract personnel—to automate that full cost accounting system and make it an e-system and that will be implemented yet this year.

On top of that, we do have plans to augment his capability by additional staff, not only full-time equivalent Federal personnel, but also additional contract personnel.

Now, his role is business oversight. In addition to that, we have scientific oversight by all of our program officers assigned to each

of these projects, and he has the responsibility to coordinate their activities and provide oversight as well.

So in my evaluation, in all due respect to the Inspector General, I think that we have made great progress. We have more progress yet to make, but it is not a process that is broken.

Senator BOND. I commended you on the steps that you have taken, but having access to 127 people is not the same as having the few that work for him, and we would like to see that business aspect totally handled. We want to see the science coordinated. We want to make sure these projects and these large facilities do function properly.

Dr. Washington, a comment on that?

Dr. WASHINGTON. Well, I concur with what Arden said.

Now, the thing is the Board has been trying to step up to the oversight responsibilities with respect to the facilities issues, and I think that the report that is going to come out this fall, hopefully, will have all of the steps, both internally to NSF, and as the Board steps in how we approve, as well as monitor, these projects as they go through their life cycle.

Senator BOND. We look forward to continuing that discussion and having some response from the IG as well.

Senator Mikulski.

Senator MIKULSKI. Thank you, Mr. Chairman. I think our colleagues should know that because of the Condoleezza Rice hearing, this will be compressed.

My question goes to the impact of the R&D funding here. When we look at the \$5 billion in the NSF budget for basic research, we are concerned that when we look at it, the industry share has fallen down. They are under so much pressure to meet bottom lines so the private sector that used to do breakthroughs, the demise of flagship institutions or the shrinkage like a Bell Lab with so many breakthroughs, so many patents, so many things that then were important to our society and led the way.

Now, what we are concerned about is either the flat or the declining Federal investment in R&D while other nations like China and India, the new turbo powers in the global economy, are increasing their investment. Can you share with us what you think the consequences are going to be to our country? And if we stay at this point, while we are looking, as Senator Bond has pressed for, a strategic plan—but it is a strategic plan for not only NSF but for our country. Could you give us your thoughts on that?

We know that your testimony has been vetted and all of those other kinds of things, but it would seem to me that if we had our druthers, we would have the NSF budget at at least 7.5 to 8 this year.

Dr. MARBURGER. With your permission, Senator, I would like to take a crack at that too.

It is true that China, India, and other countries are increasing their investment. They are trying to look like the United States and they are trying to build a base of research and technically trained people to improve their economies, and we look forward to having new colleagues to help the entire world economy.

But the United States maintains an extraordinary lead over these countries. We have huge investments. We are spending three

times in Federal support of research and development that Japan, the next largest investor in these areas, does. During the past 5 years, there has been an enormous increase in the R&D capacity of the United States. This budget is tight, but it also maintains that strength and it does move ahead in selected areas such as nanotechnology and information technology and in other areas that are important to our leadership role.

So, yes, we do have to be careful and make sure that we establish priorities that maintain our leadership. I believe that we are far in the lead now and will continue to be so for the foreseeable future. But this is a time when we have to make priorities and hard decisions, and this budget reflects that.

Senator MIKULSKI. Dr. Washington, I know you are an old hand at these types of questions and have devoted a lot of thought. As we look at the allocation, presuming Senator Bond and I will have the National Science Foundation account—you know, we have been bonded for a long time.

And we do not want to have a barb in the appropriations process.

FUNDING FOR BASIC RESEARCH

Senator BOND. Not bad for 10 o'clock.

Senator MIKULSKI. Not bad.

How would you allocate this? Would you then say we should stay the course in funding basic research? You know my own orientation to the multidisciplinary approaches on breakthroughs like nano. How would you do this? But I am concerned that if you stay flat-funded, you are really in decline.

Dr. WASHINGTON. Yes. In fact, if I can just add to that. We are seeing an enormous increase in proposals being sent to the Foundation, and with limited resources, we are going to be seeing the acceptance rate probably dropping, and that means lost opportunities.

Senator MIKULSKI. Can you give us a quantifiable statement on that? How many do you get and how many can you fund that you would consider meritorious?

Dr. WASHINGTON. Yes. I think it was last year that there was roughly \$1 billion of excellent proposals that were not able to be funded, and I expect it will be a larger number in this coming year. I think that we are up to roughly 43,000 proposals being sent to the Foundation, and with limited resources we just are not going to be able to fund all of those.

If I could just add one more thing to your earlier comment. I went to the White House at the signing of the authorization bill, and I had great hopes that the NSF budget would be increasing enormously, maybe by a factor of 2 over maybe 7 or 8 years. That hope is not there now. In other words, I think it is going to be a lost opportunity for our Nation to not have a greatly increased budget for NSF.

Senator MIKULSKI. Dr. Bement, did you want to say anything?

Dr. BEMENT. Well, I think my response would be that more and more economists are determining that what is driving our economy right now is not just savings, but investment in research and development and education. That equation has been picked up by almost every nation in the world, and so we are locked in competition for

future economic growth and also in job creation. That is especially important to the United States because we want to capture the high end of new discovery and innovation. Even today, there has been a great ramping up of the number of patents that are citing recent discoveries through basic research.

So it is an area where we have to pay attention. We have to take a longer view. And I am somewhat concerned that if you look at the mix of what is being funded in the private sector and the public sector, that too much of it is short-term. It is not just short-term in the private sector, but more of it in the public sector is becoming short-term.

K-12 MATH AND SCIENCE EDUCATION

Senator MIKULSKI. Well, I am concerned not only about the R&D issues but about education.

There are going to be wonderful Marylanders associated with Hopkins that are going to receive White House medals on March 14, Dr. Giacconi, the founding father of the Space Telescope Institute and the Hubble initiative, and Dr. Saul Snyder, the head of neuroscience at Hopkins. They are both in their seventies, and they both have been professional advisors to me, as well as personal friends. If they were sitting here, in our many conversations in their homes and in the cafes of Baltimore, they would say we need not only money for research, but we are in our seventies. We need to be able to fund those people in their twenties, those young, upstart people that are bursting to go, and then also these children, all this talent that is out there bursting at the seams with people who want to get into the honors programs in middle school, as well as in high school.

Now, I am concerned about this 12 percent cut in education. Would you tell us then how do you think you are going to address it and the consequences of this 12 percent? Because there are the Giacconis. There are the Snyders. One is someone who emigrated to this country. Again, I do not think we have a talent shortage. I never want us to have an opportunity shortage.

Senator BOND. Senator Mikulski, if I may add on that. That was going to be my next question. The math and science partnership program continues to fund only the ongoing grants NSF has already awarded. The program is supposed to be placed in the Department of Education. We never thought it would. It has not gotten proposed funding. Furthermore, the current budget proposes to reduce the number of K through 12 teachers involved with math and science education by 17,000, with teacher and material development both being cut by over 30 percent.

I think we are going in the wrong direction. Dr. Marburger, does the administration not think we have a problem with K through 12 math and science education? Is it not important? What is the rationale behind cutting the resources that the NSF needs to make sure that we have math and science education at the K through 12 level effectively addressed? I will send a strong letter to follow.

Dr. MARBURGER. Senator, the administration agrees that it is very important to have strength in teaching math and science in the lower grades. It is not obvious that putting all the money into some of these programs is the only way to go. We support strength-

ening education through a variety of means, through programs not only in NSF or not only in the Department of Education, but in investments in educational programs, educationally oriented programs in NASA, in the Department of Energy, and other areas. Even the research grants that NSF gives to the universities turn out to have an impact at education at all levels.

We believe that a sort of across-the-board consciousness raising about the importance of K through 12 education is having an impact on those areas and the budget recommendations in this proposal address a sort of across-the-board philosophy that tries to put the money in the agencies that are appropriate to this task.

Dr. BEMENT. Senator Mikulski, last year when I appeared before you, I was relatively new in the Foundation.

BROADENING PARTICIPATION

Senator MIKULSKI. Yes. You came to us from NIST, another special agency.

Dr. BEMENT. And you asked me about ATE and ISE and I was not very sharp on that, but I learned very quickly. I felt that we did, as you pointed out, need to give higher priority to broadening participation. We just have to address our total population to bring people in the STEM work force.

So taking all those special programs that address broadening participation, and if we take Math and Science Partnership aside, I took the enacted budget and actually added \$10 million to those special programs. That adds up to about \$400 million all together.

But that is not the end of the story because we have now engaged the directorates. We are taking a much more integrated approach because the science directorates also have a responsibility for education. If you take in their contributions to broadening participation, actually the total investment in the Foundation amounts to about \$597 million.

Now, with regard to K to 12 education, even though the results may appear to be disappointing from the budgetary point of view, there is a success story there because the school districts that we have funded have discovered what works. And we have been working with the Department of Education to take the lessons learned, the best practices of "what works" and work with them in making "what works" work throughout all the other school districts in the country. That is being done through an interdepartment tiger team. We are going to continue to work very closely with them. I have requested a meeting with Secretary Spellings, and we will have a lot to talk about on that score.

K-12 EDUCATION

Senator MIKULSKI. I just want to be clear about this. The math and science initiatives in curriculum, teacher development, and so on were to be research-driven. And when we work on No Child Left Behind, we want research-based solutions, not just whatever gimmicks that are being sold, et cetera.

Now, are you saying that now the results are coming in and now you see this then disseminating to the 50 States, to the 180-some school districts—

Dr. BEMENT. No, Senator.

Senator MIKULSKI [continuing]. In terms of research knowledge, symposiums, this type of thing?

Dr. BEMENT. The administration fully supports our research activities in this area, and we intend to continue our mission in doing research in this area.

Senator MIKULSKI. You said you have got lessons learned, best practices. You want to meet with her.

Dr. BEMENT. Yes.

Senator MIKULSKI. What is the point of the meeting?

Dr. BEMENT. The point of that is that in our pilot programs with the various districts that we support, we are learning through our research what can be effective in improving science and mathematics education. We will never have the resources or personnel to propagate that throughout the entire Nation. We have to rely on the Department of Education to carry out the propagation role.

Senator MIKULSKI. Well, that is the point, to take the lessons learned, the best practices, go to I think a very dynamic Secretary of Education and experienced and seasoned in the field to then propagate that.

Dr. BEMENT. We have that partnership.

Senator MIKULSKI. Well, actually I will look forward to hearing about that because we do not want research mortuaries where we just collect the data and it just gets banked somewhere, you know, the way they freeze things for the future.

There are so many interesting things to be covered.

PLANT GENOME

Senator BOND. Senator Mikulski, we have all noted the research mortuaries.

We have run out of time.

Dr. Mary Clutter is here. Dr. Clutter, will you stand up please? Thank you very much. I was going to ask you to give a report. Unfortunately, we have run out of time, but I want everybody here to know how important the work is that is going on in the plant genome area. We have 800 million children worldwide that are hungry or malnourished. We know that nutrition and food production are critical to the health and economic opportunity for all countries, and there are a lot of new industrial energy and pharmaceutical applications to new food technologies that can serve to ensure our Nation's producers and the world's population and we can benefit from this with aggressive work. I would ask for the record you update us on the genome project and your efforts to create collaborative partnerships between U.S. and developing country research institutions.

I would note for you, without asking for any endorsement from the NSF, the fact that Senator Mikulski and I have introduced a measure recommended by Dr. Danforth's blue ribbon committee to establish a food and agricultural research arm to do the basic research. We want to bring with that additional funding because we know how strapped your Foundation funding is. But the best minds in the scientific community have steered us in this direction to say that we need basic research to utilize the tremendous potential in this area. Senator Mikulski and I and a number of others will be reintroducing that. We would welcome your comments and sugges-

tions on it and would look forward to having a report that we will try to publicize. I hope everybody who is here will read it. Certainly Senator Mikulski and I will.

Senator Mikulski, any closing thoughts?

Senator MIKULSKI. No. I think we just want to thank you for what you do. As you can see, we certainly have the will to be supportive and we need to find a national wallet. So thank you.

Senator BOND. Thanks so much to our witnesses, to all those who attended. We apologize. Due to other commitments, we have to bring this hearing to a close, but we certainly hope to have the opportunity to continue to work with you. Stay tuned and we will find out whether we do.

SUBCOMMITTEE RECESS

The hearing is recessed.

[Whereupon, at 10:03 a.m., Thursday, February 17, the subcommittee was recessed, to reconvene subject to the call of the Chair.]